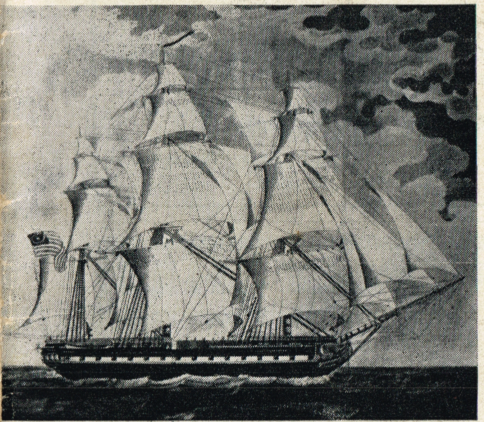
Bittle

# Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

USS CONSTITUTION



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ONE SHILLING 4 JULY 1957 VOL 116 NO 2928

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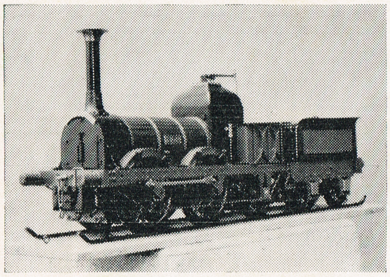

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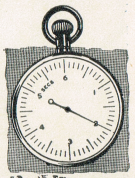

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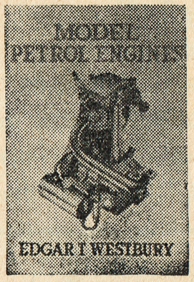


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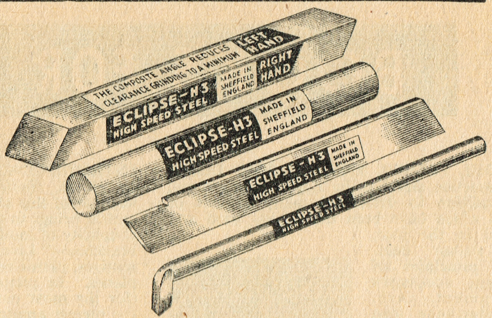


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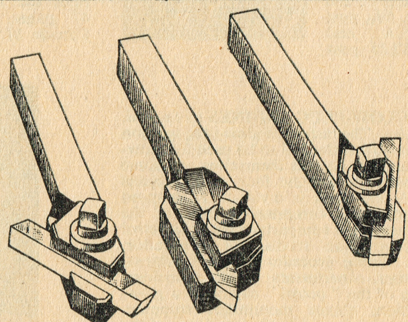

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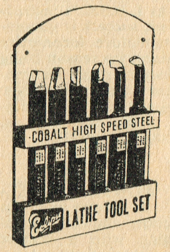


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# Model Engineer

ONE SHILLING 4 JULY 1957 VOL. 117 NO 2928

Published every Thursday Subscription 58s. 6d. (USA and Canada $8.50) post free

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## Next week

**Narrow-gauge locos:** A brief history of the sub-standard gauge locomotive

**Science and skill:** Modern technical advances call for the kind of craftsmanship displayed by the model engineer

**Brighouse open day**

**Diesel locomotives:** The uninspiring but efficient engine of the mid-twentieth century

The Editor is pleased to consider contributions for publication in MODEL ENGINEER. Manuscripts should be accompanied by photographs and/or drawings and should have a stamped addressed envelope for their return if unsuitable. None of the contents of MODEL ENGINEER may be reproduced without written permission. All correspondence should be addressed to the Editor, Model Engineer, 19-20 Noel Street, London, W1.

# Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

WHEN in the course of human events it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable rights, that among these are Life, Liberty and the pursuit of Happiness.

For Americans everywhere July 4 is Independence Day. One hundred and eighty-one years ago, on July 2, the Declaration drawn up by Thomas Jefferson, the music-loving scholar from Virginia, was signed by the Fathers of the Republic; and two days later a bell in Philadelphia, the Liberty Bell at Independence Hall, rang out the tremendous tidings that the 13 colonies were "Absolved from all Allegiance to the British Crown."

July 4, 1776, is a date that belongs to all men. It is also a date for which all free men should be grateful. A new nation had come to birth in the hope and courage of great ideals, and its growth was to change the world.

We, therefore, have pleasure today in saluting our readers in the United States, the many thousands of model engineers, the lovers of old engines and ships, and all who share the comely traditions of the English-speaking brotherhood.

## The folks in 'Frisco

LARRY DUGGAN, who sails from England today (July 4) in the *Queen Mary*, called at Noel Street during his visit to learn how the folks back home in 'Frisco were getting along.

As many readers are aware, Larry edits *The Callboy*, news-sheet of the Golden Gate Live Steamers. The new issue had been published since his departure from San Francisco and a copy was in fact lying on my desk.

What Larry read seemed to please him—except for the news that earthquake tremors were continuing. San Francisco had been wobbling at the time that he left, but people were still calmly at work in the tall swaying buildings. "See that your model is anchored safely," advised *The Callboy*, "before returning from your shop. Incidentally, spare a thought for the care of your wife when the next big jolt comes."

Mr Duggan can remember the terrible earthquake of 1906 when so much destruction was caused in San Francisco that the city had to be rebuilt.

## Smoke Rings . . .

### Club meets club

In England, Mr Duggan was keeping an eye out for live-steam rallies, tracks, exhibitions or anything that fell within the scope of his visit.

His live-steam colleagues in California have been listening with pleasure to a long-playing 12 in. record *Farewell to Steam*, commemorating the last steam run of the Santa Fe between Los Angeles and Barstow. They have also enjoyed a film *The Steam Locomotive*, made by the Southern Pacific.

Mr Duggan casually remarked that some of the visitors at the Golden Gate Spring Meet, where the Santa Barbara and Southern Californian enthusiasts turned up in force, had travelled 420 miles to be present, making a journey of 840 miles in all. Sometimes a club flies from one place to another !

### So much to see

Nevertheless, small though England is in comparison with the United States it contains more than any one man could absorb in a thousand lifetimes. Model engineers visiting the Old Country find themselves torn between the attractions which appeal to every tourist and those which appeal to the modeller especially.

For the shiplover in particular London holds a tremendous wealth of interest. The National Maritime Museum at Greenwich, the Ships Gallery of the great Science Museum in South Kensington, the Imperial War Museum—these three are inexhaustible.

I doubt if enough Americans know what treasures are contained in the Public Record Office and the Royal United Services Museum. The first of these holds, besides such treasures as the Olive Branch petition to George III and the birth certificate of Virginia Dare (the first child born of English parentage in America—on August 18, just 370 years ago), Washington's map of the Ohio, a map of New York in 1700, and a description, with detailed accounts of pirate activities, of a voyage aboard a British warship to the "Western part" of America in 1666-7.

### Voyage to Virginia

Bush House at Aldwych was designed by Irving T. Bush, who built the thirty-storey Bush Terminal Sales Building in New York. As part of its dedication "To the English-speaking peoples of the world" it bears on the side nearer the Strand two tablets, each depicting a ship. One is the "Viking discovery ship of Leiv Eriksson DCCCCI" and the other "Flagship of Columbus, *Santa Maria*, MCDXCII."

Down at Blackwall the American will find at Brunswick Wharf a tablet commemorating the departure on 19 December 1606, of three small vessels with 105 men and women on board: 105 who were to be founders of Jamestown. And only two or three hundred yards from the MODEL ENGINEER office a model of *Mayflower* in gilded copper forms the weather vane of Liberty's famous store.

This summer we have been thrilled by the voyage of *Mayflower II* under the command of Alan Villiers, whose writings are very familiar to our ship modeller readers, and in a few months' time, when America wears the red and gold of the Fall, the Queen and Prince Philip will be in Washington and Jamestown, adding strength to bonds which history has tightened since the Liberty Bell ran out on 4 July 1776.

*R. H. Mapplebeck, well-known modeller and contributor to* MODEL ENGINEER, *with his boat* GISELAR *at a recent Victoria Park event*

### The index

THE short announcement on page 22 of this issue that the index for Volume 116 of MODEL ENGINEER is now ready will be welcomed by the many readers who carry out their own binding. At the same time, there will be others who feel that the index should be an integral part of the issue, as it has been at various times in the past.

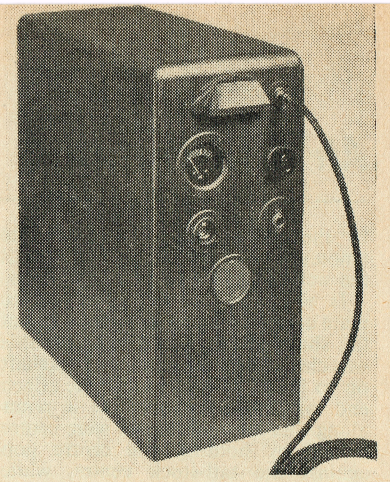
I have much sympathy with this view, but the hard economics of present day publishing govern the policy in this matter. The cost of adding extra pages to the issue for an index is prohibitive under present conditions and to use six of the existing pages would displease far more than would be pleased.

So, as a compromise, the index is printed separately and is sent out in an envelope on request and on payment of 1s. The transaction is carried out at a loss as far as we are concerned, but not such a crippling one as it might be.

### Cover picture

*Two views of USS* CONSTITUTION. *The large picture, by courtesy of the Peabody Museum, Salem, shows the* CONSTITUTION *at anchor in Boston Naval Yard. The smaller illustration is from an engraving by A. Bowen after W. Lynn. Joseph Martin writes of this famous American frigate on pages* 18 *and* 19.

# A miniature air compressor plant



*The finished unit*

**B. G. GYLES built this tiny compressor which delivers air at a steady 50 p.s.i.**

THE plant was made to operate my wife's Aerograph artist's spray-pencil. It is completely automatic, easily portable, and provides a supply of air at 45-50 p.s.i. simply by plugging it in to the nearest electric point and switching on.

There is a big margin of air for the sensitive Aerograph spray; the compressor cuts in only for about ten seconds in every minute during continuous use. There are no noticeable pulsations from the high-revving compressor when it is running.

It should be noted that the plant was not designed for use with commercial paint spray-guns, although it would probably operate the little ME spray-gun quite well.

Great care went into the making of the compressor itself, and some trouble was also taken to give the finished unit a neat appearance for use in domestic quarters. Apart from that, the job was strictly utility, no time being spent in trying to make the " works " look pretty.

## GENERAL ARRANGEMENT

Fig. 1 gives a diagrammatic layout of components, piping and electrical wiring. The dimensions of the plant, and its general arrangement, will depend on the size of motor and air receiver used. It is advisable to check that the motor is powerful enough to work the compressor under load, before planning a compact layout which may have to be altered if it does not.

In the unit described, I used a thick wooden base 15 in. × 7 in. and I was able to restrict the height to 16 in. The square sides can be of plastic or plywood, fixed with five woodscrews to permit removal for servicing. A handle on the top similar to that of a sewing machine would be better than one at each end, as fitted.

The ends are of ½ in. timber, and make a convenient mounting for the instruments and controls. No rubber feet were fitted as the plant is always in use on a carpeted floor.

Air enters the casing through a 2 in. dia. disc of petrol strainer gauze, obtainable in 3 in. square free sample sheets from your ironmonger if you are lucky. A filter using similar material was fitted to the air intake of the compressor (Fig. 5). All fittings were made on the lathe, and joints brazed or silver soldered.

## THE COMPRESSOR

A Stuart Turner 1 in. bore twin-cylinder air compressor was made from castings and drawings supplied by that firm. This was a pleasant task with very few snags, although I had never previously tackled anything of this nature. I ran into trouble only with the crankshaft. This is a very neat forging, which I soon bent into a semi-circle, and gloom descended until a replacement arrived.

Success was achieved at the second attempt, and though the method is not original, those who have never had to machine a twin crankshaft of this type may like to know how it was done.

The crankshaft has flat-sided webs, and it was decided to machine these first, by clamping it to the face plate. Care was taken to cause no distortion

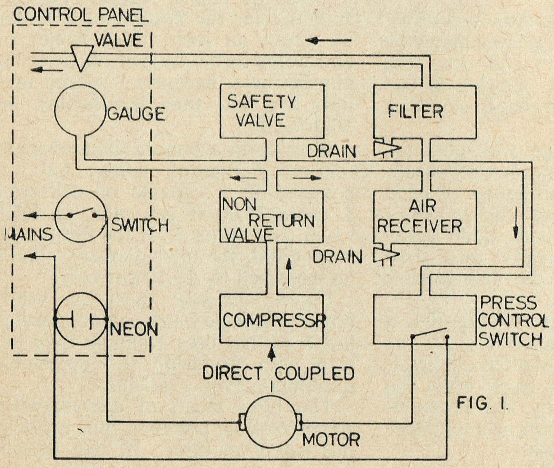



FIG. I.

*Left: Diagrammatic layout of plant*

*Right: Details of the filter device*

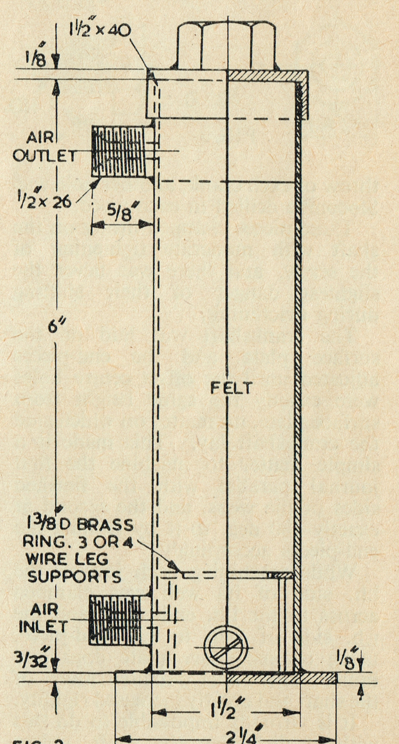



FIG. 2.

# Air compressor . . .

by the clamps, and an appropriate amount was taken off each side until the webs were the required thickness.

It was then laid flat on a surface plate and a line scribed on each end of the shaft; the correct height for this was checked by turning the crankshaft on to its other machined side. Each end was centre popped at a point along this line. The ends were centre drilled by holding one centre pop against the tail-stock centre, while feeding the other against a revolving Slocombe bit.

The crankshaft was mounted between centres and about 1 in. at each end machined to a good finish oversize, to the same diameter as one of my stock reamers.

## MACHINING THE JOURNALS

It was then necessary to make two end-pieces in order to provide offset centre holes for revolving the shaft eccentrically while machining the journals. These were drilled and reamed to a good fit on the crankshaft, the ends split with a hacksaw, and a screw provided for drawing these up like split bearings. At a distance from the centre of this hole, equal to the throw of each crank, another hole was Slocombe drilled in each piece.

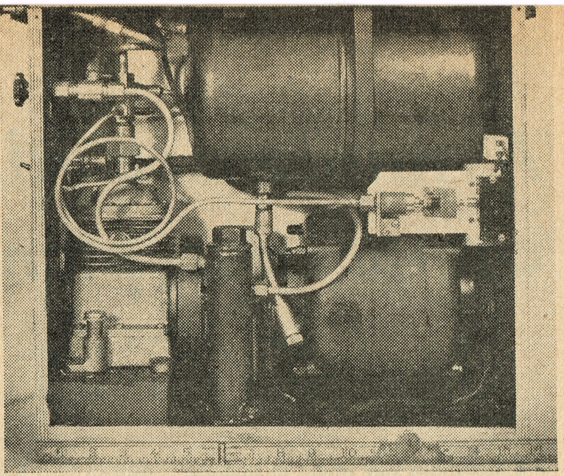
These pieces clamped firmly on the shaft with moderate tightening of the screw, and there was never the slightest danger of their shifting during machining.

The crankshaft was laid on the surface plate and the end-pieces adjusted until the offset centre holes were exactly the same height from surface plate, no matter on which side the crankshaft lay. This made it a simple matter to machine the first journal parallel with the finished sides of the webs, and the second at exactly 180 deg. to it by turning the end-pieces accordingly.

While machining each journal the l.h. side of its web was clamped across to the l.h. end-piece, and the r.h. side of web to r.h. end-piece, using ordinary face plate dogs and bolts. This short circuited much of the shaft and greatly increased rigidity.

It is virtually impossible to do this without distorting the shaft, unless it is checked with a clock gauge in the lathe at all possible angles before and after tightening the clamps. This was the only difficult part of the work, but it is even more difficult to machine the journals without the clamps.

One must also guard against overtightening of the tail-stock centre; this needs constant checking against expansion of the shaft due to heat from machining.



*The assembled compressor unit housed in its compact box*

## COUPLING UP

The cylinders were left 0.002 in. undersize and taken to a motor engineering firm for lapping by Delapena hone. This cost about 8s. and was well worth the trouble it saved. The cast pistons were completely machined while soft soldered to mandrels, leaving only the skirts to be faced up after detaching them with a parting tool.

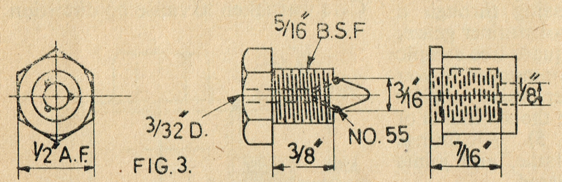



FIG. 3.

*Screw plug which ensures a tight seal*

The finished compressor was direct coupled to a 1/6 h.p. electric motor by 2 in. of garden hose and two hose clips. Direction of rotation is immaterial as it has spring-loaded disc valves.

The pressure-gauge was obtained for 2s. 6d. from a motor scrap-heap, and is an old car oil gauge. I have used many of these for pressure-gauges, and find them quite satisfactory. They usually read 5-10 per cent high, like the speedometer on a modern car.

The neon indicator light fits a standard b.c. lampholder—or the connections can be soldered on direct. It is so wired as to glow while the motor is cut out by the pressure-control switch, and acts as a reminder to switch off after use.

A non-return valve was fitted, consisting of a rustless ball dropped into a standard brass gas coupling with a suitably prepared seat. It turned out to be unnecessary—and so it should be if the compressor valves have been properly finished. In any case, the pressure builds up so quickly (37 sec. from zero) that it is hardly worth while attempting to hold it for long periods when the plant is out of use.

The compressor passes a small quantity of oil and moisture, so an air filter is essential. Recently I topped up the sump with two small eggcupfuls of Shell 10W/30 oil after 12 months of use averaging an hour or so a day: testimony to Stuart Turner's sturdy design, and a performance which many motorists might envy!

The drawing (Fig. 2) shows a scaled-down version of an improved filter which was made recently for my own workshop air supply. Note that air inlet is at the bottom and not as in the photograph (the latter filter has baffles which serve no purpose whatsoever and can, therefore, be eliminated).

The air passes upwards through a tight roll of carpet felt pressed into a brass or copper tube. The felt should clear the bottom of the filter by about an inch; this enables oil and water to be drained off periodically before it becomes "wicked up" into the felt, thus lengthening the latter's life.

Sizes given are more than adequate for an Aerograph spray, but the compressor is capable of delivering at least 1¼ cu. ft per min. at 1,400 r.p.m. and 60 p.s.i. If the full output is required, the filter diameter should be increased by 25-50 per cent.

Filter efficiency must be really high for delicate water-colour painting, but for other uses a simple oil/water trap with provision for occasional draining may be satisfactory.

The filter must, of course, withstand working pressure, plus a generous safety margin. If, like myself,

you cannot cope with the $\frac{1}{8}$ in. thick circular base and the two lower bushes in one operation, braze the base on first. The bushes can then be silver soldered at a lower temperature.

Turn a recess in the base before brazing, to ensure its being accurately located on the tube. Afterwards it can be gripped in the s.c. chuck, the other end of the tube supported in the lathe steady, and a suitable *fine* thread cut at the top of the tube for the screwed cap. A coarse thread will weaken the filter body dangerously unless very thick tube is used.

If the tube is of copper, difficulty may be experienced with the thread cutting. An alternative is to braze a $1\frac{1}{4}$ in. dia. × 3/32 in. thick brass ring about $\frac{3}{8}$ in. long to the outside of the tube. After skimming this up, a thread of about 26 t.p.i.—which is far more satisfactory—can be cut. This method also provides a better seating for the cap, which is increased in diameter as necessary.

## FITTINGS

Silver solder on the air delivery union last of all, to avoid fouling the lathe steady while turning. Braze a large hexagon head on the cap, fit a leather washer inside, anoint with Osotite before screwing down, and it should be a long time before re-pressing sound like a deflating tyre, which can be heard whenever the motor cuts out. For that reason a commercially made safety valve is unlikely to be satisfactory.

A modified version of the blower valve described in the same article was used for the main air valve. Threads $\frac{7}{16}$ in. and $\frac{1}{2}$ in. × 26 t.p.i. were used for most unions and fittings in the unit.

There is probably no need to use such a heavy gauge of tube as that shown, nor is coiling really necessary; I happened to have this material in stock. It is a good thing to err on the generous size between compressor and air receiver, however; very small bore tube might cause back pressure, throwing an unnecessary load on the motor. Here one can be guided by the hefty air delivery union which Stuarts provide with the castings.

Simple screw plugs are sufficient for the filter and air receiver drains, which only need attention periodically. Do not remove them while the unit is under pressure !

Nevertheless, the type of plug shown in Fig. 3 is well worth making; a pressure-tight seal is obtained without difficulty, and it needs only to be slackened off to " blow down." Complete the turning first, drill the blind 3/32 in. hole, reverse in chuck and use the chuck jaws as a guide

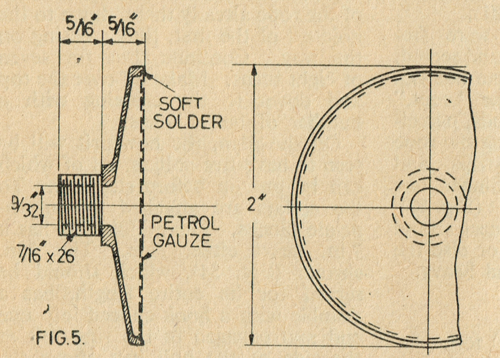
the need of more than average workmanship.

Most micro switches are two-way, and can thus be wired so that clicking in switches them *off.* They also have the feature of not " unclicking " until a noticeable drop in the applied pressure has taken place. This, together with unavoidable friction in the outer mechanism, eliminates " chatter," and avoids too-frequent stopping and starting of the motor.

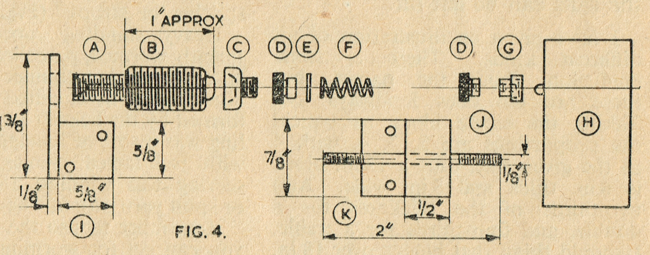
It is necessary to choose a bellows with the correct characteristics: the Drayton Regulator Company, West Drayton, Middlesex, will supply a list with technical details on request. Thereafter the pressure at which the switch operates depends upon the strength of spring fitted and its adjustment.

I used Hydroflex Bellows No AS12617, suitable for pressures up to 180 p.s.i.; this has maximum permissible movement of 0.218 in., and an effective area of 0.31 in. sq. Effective area multiplied by working p.s.i. gives approximate strength of spring required.

To avoid damage to the bellows, it should be in a compressed state when at rest, without being unreasonably strained into compression. Its expansion under pressure must be kept within the maker's figure by limiting movement of the switch




*Gauze disc which is fitted to air entry*




A *pipe union*; B *Drayton metal bellows*; C *thrust cup*; D *milled nuts*; E *washer*; F *spring*; G *metal striker mounted on insulated bush*; H *micro switch*; I *thrust plate*; J *operating rod*; K *bearing*

placement of the felt is necessary.

Instructions for making unions and other fittings have been given many times by LBSC and others far better than I could do. The safety valve described by LBSC for *Ivy Hall* in the issue of 8 March 1956 is recommended.

Instead of the dwarf body, use $\frac{5}{8}$ in. hexagon brass, and thread $\frac{5}{16}$ in. of this $\frac{1}{2}$ in. × 26 t.p.i. Turn down most of the remainder to 19/32 in. dia., leaving about $\frac{5}{16}$ in. length of hexagon adjoining the thread.

Extra special care in the making of this will be well repaid. The slightest weep will be accompanied by a de-

when drilling the three No 55 holes by hand.

It may be necessary to extend the air receiver drain by tube to an accessible place (see photograph).

## PRESSURE-CONTROL SWITCH

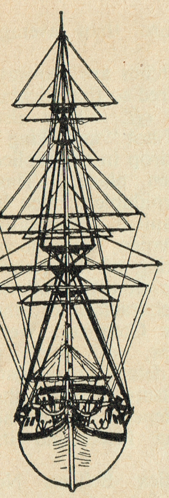
The pressure-control switch described by J. H. Turner in issue No 2916 would be very suitable for this plant. My own was made upon a similar principle using a metal bellows instead of the rubber diaphragm (Fig. 4). I cannot claim that it is better than Mr Turner's, for both will do the job equally well without

mechanism. Modern metal bellows are quite rugged, but none will stand up to being stretched beyond their limits. Total movement required to operate the micro switch is unlikely to exceed 40 thou, so there is ample margin.

Do not experiment with any of the numerous aneroid bellows available from old bombsights, etc.; these are hopelessly unsuitable, and may explode under pressure.

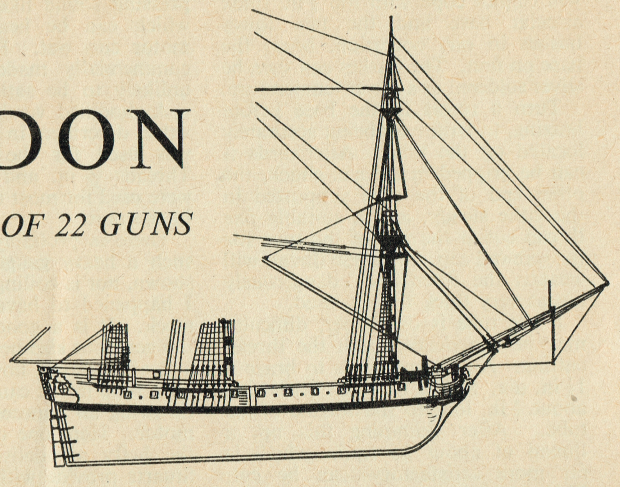
Use a non-conducting striker on the pushrod to isolate the micro switch electrically and prevent any chance of the whole plant's becoming

● *Continued on page* 32



# MYRMIDON

## *A SHIP-RIGGED SLOOP OF 22 GUNS*



**Part 7.—Constructional details of this model of an 18th century man o' war have now reached the blocks and standing rigging. R. J. COLLINS is the author**

As to the blocks, there are a large number and of all sizes and shapes. At the time of writing I have been unable to work out the quantity needed but there are certainly a lot. The number naturally depends upon how much rigging you do. The standing rigging and the lines connected with the yards are a must, but the rigging attached to the sails can be left off.

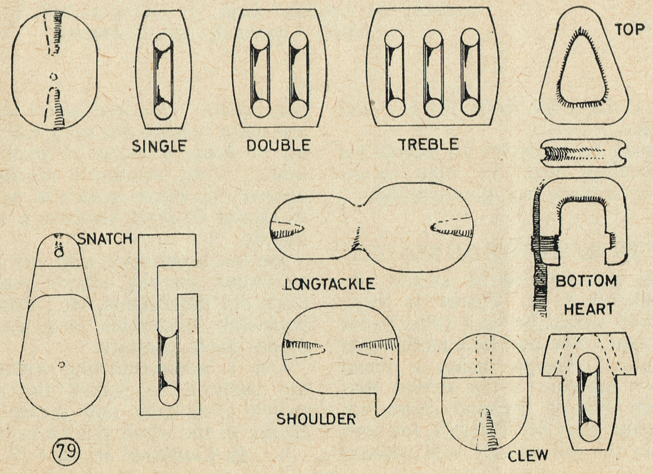
I have given an illustration of all different kinds. There is some confusion about the names, but these are the ones I always use. Taking the single block as typical the proportions are 2, 3, 4, with 4 as the given size, thus a 12 in. block is 6 in. thick and 8 in. wide. Add two-thirds of the thickness for a double, and four-thirds for a treble. I should think that blocks over 18 in. were a little thinner in comparison.

Blocks named "Flat" or "Thin" were about two-thirds the normal thickness.

There are a number of ways in which blocks were attached to the yards: held in the bight of a collar which was itself held by the lashing together of two thimbles or eyes; lashed to a thimble, which is seized to another one held by a collar; and a double strop, or a long and short strap. (Fig. 80). Blocks were attached to ropes either by direct splicing or strops (Fig. 81).

Heavy standing ropes were frequently wormed, parcelled and served. In other words a thinner line was run along the grooves, called the "cont," formed by the heavier strands, parcelling was a sort of bandaging the rope with well-tarred canvas strips, and serving was winding a thinner line or spun yarn around the lot (Fig. 82).

Remember to use the finest strand you can get for worming or else the result will look clumsy and heavy.

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Start the rigging with the gammoning of the bowsprit (Fig. 83). This is the rope that passes over the bowsprit, down through the head rails and the gammoning hole to help keep the bowsprit down. Take a length of 5 in. rope and make an eye in one end. Pass this under the bowsprit from port to starboard, the running end over the top and through the eye, straight down to the forward end of the gammoning hole, then up the port side, over the top forward of the rope already there, down to the hole *aft* of the first, thus crossing on the way. Continue thus for seven or eight turns. Make off over the top and down to the crossing with a number of half hitches.

On the plan, the bowsprit will be seen to have five collars, all of which can be put on before stepping. To the collars are attached the appropriate blocks. The middle one has a 7 in. heart either side. The 5 in. shroud (Fig. 54), which should be served for its entire length, has a thimble with a hook spliced into one end and engaged in the ring-bolt at the side of the hull just above the wale. (This part is known as the bends.) The outer end has a 7 in. heart turned in to reach about twice its length from that on the bowsprit. The two are held together by a $2\frac{1}{2}$ in. laniard (three turns) starting and finishing at the outer end.

The two bobstays (Fig. 85) were wormed, parcelled and served throughout their entire length. For a model, I think I should dispense with the parcelling. The actual stay is double, the lower part passing through the bobstay hole near the cut-water. The outer ends are secured in the same manner as the shrouds, but with 3 in. laniards.

"Horse" is the name given to the rope upon which the men stand or

against which they lean when working on the yards or bowsprit (Fig. 86). The horses of the jib are 3 in. rope and are beneath the spar. They are different from the others in having knots spaced about 3 ft apart along their length to prevent the men's feet slipping.

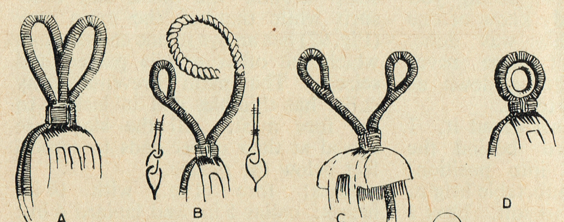
The outer end is made fast at the shoulder of the jib, and the inner end is secured to the base of the jib just inside the cap. Steele says, "A bight is taken over the outer end of the jib-boom with a jambing knot. . . . The inner ends are stopped back with two or three seizings of spunyarn to prevent their being cast off by mistake."

The horses for the bowsprit, also 3 in., are fastened to eye bolts on the inside of the cap. The inner end, having a thimble, is lashed to eye bolts on the timber head either side of the stem with $1\frac{1}{2}$ in. laniards.

Standing rigging of the masts with the pendants of the tackles (Fig. 87). On the plan these are shown coming out in front, but that is only for clarity; they should hang down straight. Pictures and models usually show them thus, but I feel that they would have been loosely secured to the shrouds in actual fact. Some are so secured on Longridge's *Victory*. The tackles, which were such a prominent feature in the older ships, were at this period detached and stored until needed.

On the fore and main masts there are a pair aside and only one on the mizen. They are the same size as the shrouds and I suggest that the first one be joined to its companion on the other side with a cut splice, the second being paired with the first shroud. This will leave an even number of shrouds to be dealt with. On the main mast there is an even number of shrouds, so the tackles are paired. With the mizen, the single pendant can be paired with the first shroud. All the pendants are served for their entire length and end in thimbles. Length of the fore pendant 9 ft, main 10 ft, and mizen 8 ft.

After the tackles come the shrouds (Fig. 88), which should be "shroud laid." A properly laid shroud consists of a centre rope around which

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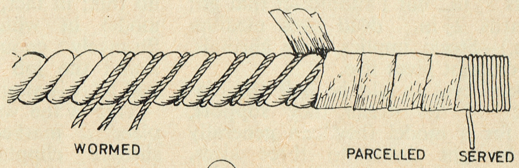


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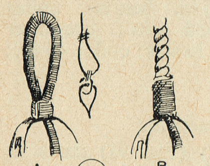


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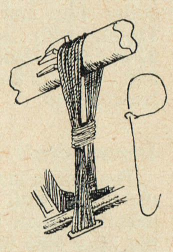

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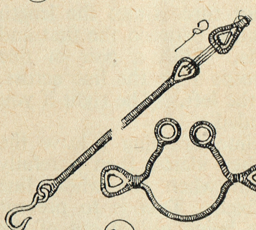

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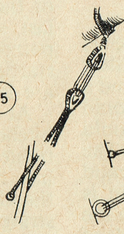

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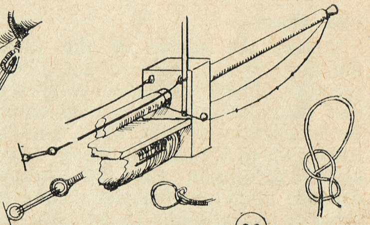

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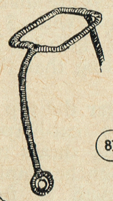

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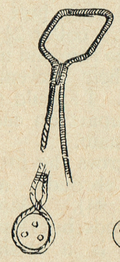

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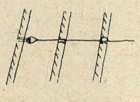

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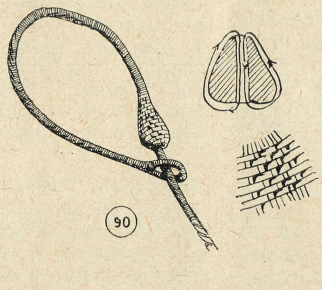

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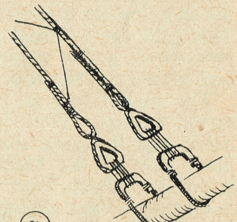

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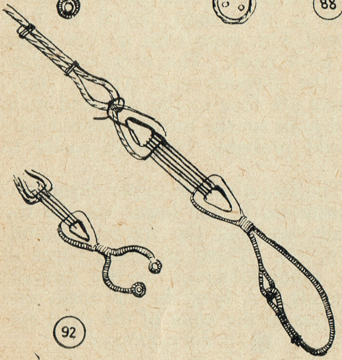

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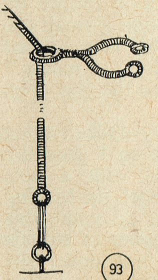

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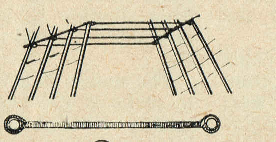

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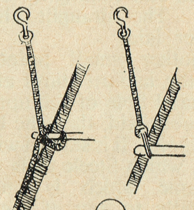

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are laid four strands in a cable direction. For models, a cable laid rope is considered enough. Sometimes "ordinary rope" was used for small ships and, frankly, I don't know if *Myrmidon* qualifies for this or not. In any case the first shroud and the middle quarter of all the rest should be served.

Thickness of both tackle pendants and shrouds: fore 7½ in.; laniards 4 in.; ratlines, which I will deal with in a moment, 1½ in.; dead eyes large—Steele says 11 in. for the dead eyes and gives 12 as the number, that is six shrouds aside, but the draught definitely shows the nine I have put. Main, same sizes—and again Steele gives 12 dead eyes, six shrouds aside, while the draught shows 10; mizen shrouds 4½ in., with the tackle pendants 3½ in., but I should let that go; laniards 2½ in.; dead eyes medium (7 in.)—Steele implies four shrouds, the draught gives five.

Dead eyes should be half the diameter of the masts they support, but for a model they can generally be brought down to three sizes, "large" 11 in., "medium" 7 in., and "small" 5 in. I use actual sizes of $\frac{3}{16}$, ⅛, and 3/32.

**Now closer**

During the course of the years the dead eyes seemed to get closer together. I have made them two and a half diameters apart but they could be brought in to two, but I should leave that to a final tightening. The actual turning-in on the shroud depends upon whether the shroud is cable or hawser laid. In any case the shroud passes down through one side of the dead eye, and up the other, behind the standing line and up the other side. This calls for a throat seizing at the cross-over, a flat seizing just above and another at the top.

The actual end is parcelled with tarred canvas. Now if the rope is cable laid it passes down the right-hand side of the block looking inboard and finishes off on the right-hand side of the standing line. Hawser laid is just the opposite. At this scale, to keep the position of the dead eye, I find it very difficult to make a throat seizing so I make a flat seizing instead, but with the rope still passing behind and coming up on the correct side. The draught shows as for hawser laid.

Another small point. If cable laid the laniard starts at the bottom left-hand hole of the upper dead eye; if hawser laid, then the bottom right-hand hole. It is started with a stopping knot, which Steele calls a "walnut," a name which is applied rather generally to any of the "Wall and Crown" knots. It is quite a complicated bit of back splicing, so I suggest the use of the ordinary thumb knot or figure-of-eight. The running end is finished by passing between the throat seizing and the dead eye and clove hitched. Failing this a clove hitch around the place where the seizing is. Leave the end longish until you are certain that no more adjustments are needed.

Ratlines are the thin lines which connect the shrouds and form the rungs by which means the men reach the tops (Fig. 89). Up to about 1700 they were probably clove hitched all the way with the ends stopped down. After that (very approximate) date the ends were eye spliced and lashed to the outside shroud, the remainder, of course, being clove hitched. I am not suggesting you do this; in fact, I only know of one model in which this was done. Strangely enough, I have never found the job of ratling down as bad as it is supposed to be.

This is the way I set about it. I place a marked card behind the shrouds, clipping it into position; set the model at a comfortable height, which can be varied to suit. Next I cut a dozen lengths of the finest cotton about three times the length of the distance between the first and last shrouds. With a pair of fine pointed forceps I tie the line across, starting at the left. (The right if you are left-handed.)

At the time of tying I leave the hitches rather slack, then carefully tighten them when the whole line has been fixed. This is to prevent the shrouds being pulled out of the straight. For this reason also I do not tie in consecutive order but roughly as follows: 1, 12, 6, 8, 4, and the rest. When they are all done I soak the knots generously with shellac. I find that the ends can be cut off easier if they too are soaked and allowed to stiffen. Don't be in too much of a hurry to trim.

**Making the "mouse"**

Over the shrouds go the stays—the heavy ropes which run forward and downward from the mastheads. They are held to the top of the masts by means of a large loop formed by passing the rope through a small eye splice in its end. This is prevented from slipping back by a "mouse" or stopper worked into the stay (Fig. 90).

The mouse is a very difficult thing to make at this scale so I generally turn a wooden bead with a hole large enough to take both the binding and the stay. If you do yours this way wind an odd number of strands through the centre and down the outside and then thread them basket fashion. Slide it into position and secure it with a spot of glue. In the case of the lower and top shrouds of the fore and main masts there are lighter stays called "springs" or "preventers" accompanying the ordinary ones. They are put on top of the others but pass through the large loop and so finish up below them.

A heart is secured by a throat and two flat seizings into the lower end of the stay and this is laced to its opposite number by four or five turns of a laniard. In the case of the fore lower stays the second block of the pair is an open or U-shaped one. The rope which holds the lower block to its moorings is called the collar. Those of the fore stays (Fig. 91) are spliced as a continuous strop around the block and bowsprit while that of the main stay (Fig. 92) has an eye in one end through which the other end is passed and seized. The main preventer stay collar has thimbles and is lashed to the fore mast. All the stays are served at their upper ends to several feet below the mouse.

Sizes: fore 11 in., with 14 in. hearts; collar 5 in. and laniard 4 in.; preventer 7 in., with 11 in. hearts; collar 4 in. and laniard 3 in.; main 11½ in. with 16 in. hearts; collar 8½ in. and laniard 4 in.; preventer 8 in., with 12 in. hearts; collar 4½ in.; laniard 3 in.

**Darcy Lever's methods**

The mizen stay (Fig. 93) starts as the others with loop and mouse but passes through a thimble secured to the after side of the main mast and finished with a thimble instead of a heart. This is lashed to a fairly large ring bolt in the deck. Stay 3½ in.; collar 2½ in.; laniard 1½ in.

The fore and main stays are snaked to their preventer stays with 3 in. rope. I should put the clove hitches 6 ft apart on each, noting that they alternate.

Across the inside, near the top of the shrouds, are the cat-harpins (Fig. 94). Darcy Lever shows two methods, but I have chosen the simpler. This is a straight length of fully served 4 in. rope with an eye splice at both ends. The eyes are seized to the shrouds and futtock stave. There are four to the fore and main and none on the mizen. Served wire would probably be much easier to fit.

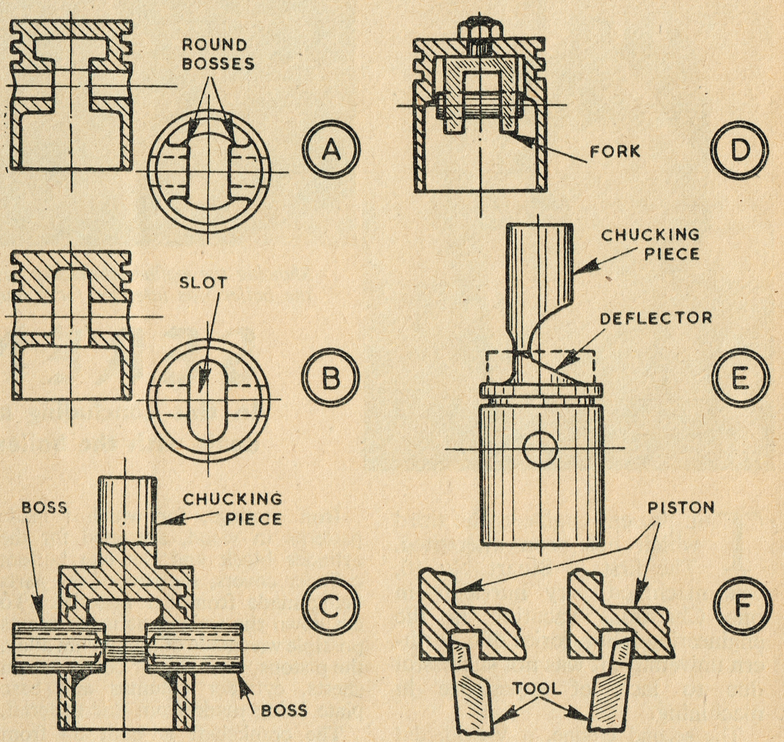
The strain of the upper shrouds is transferred to the lower via the top dead eyes and the futtock shrouds (Fig. 95). These are short ropes of the same thickness as the topmast shrouds. A hook in the upper end engages in the plate of the dead eye.

● *To be continued*

**BEGINNER'S WORKSHOP**

# Small piston construction

**by Geometer**




ALTHOUGH a relatively simple component, a piston because of its internal shape offers constructional difficulties—in the smaller sizes at least. Without gudgeon pin bosses, a piston could be concentric inside and out; but the gudgeon pin would then have bearing surfaces only in the thin side walls. Thickening the walls adds to the weight of the piston, which is undesirable as it is a reciprocating component.

The ordinary construction, therefore, is a piston which has a concentric interior and integral bosses providing adequate bearing surfaces—an interior which in the commercial pistons of cars and motor-cycles may be strengthened with struts and ribs. For a model piston, as for the larger sizes, the ordinary construction as at *A* requires a casting, and this in turn demands a pattern and a core box for casting the interior.

### Two methods

The alternatives in small sizes, utilising bar material, are machined-from-the-solid and built-up constructions. Machining from the solid, the interior is produced by boring and milling. Up to where the gudgeon pin "bosses" will be, the piston can be bored in the normal way. Then to form the bosses, a slot is milled as at *B*, setting the work up on the top slide or vertical slide and running an end mill in the chuck. If desired, the milling operation can be preceded by drilling two holes at the extremities of the slot, so only the metal between has to be milled away.

In very small sizes, the milling operation completes the interior. But in larger examples, a boring tool can be used above the bosses; and employing the vertical slide, some metal can be removed from the sides of the bosses, which eventually are approximately square. At the expense, then, of extra work, such a piston compares reasonably well for weight with one which has been cast, the material being aluminium alloy or duralumin bar.

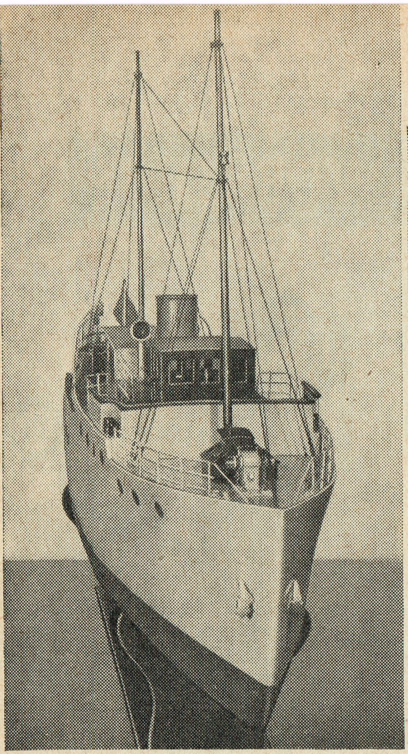
For built-up constructions, there is the choice, broadly, of three methods: 1 crown and bosses can be made as a separate piece and the skirt screwed on—which results in a somewhat heavy piston and one whose parts may loosen with heat and vibration; 2 using cast-iron bar, the bosses can be bronze-welded in as at *C*, when the interior has been machined; 3 the bosses can be provided by a separate forked piece as at *D*, held by a nut on the crown, a construction which also solves the problem of endwise locating the gudgeon pin.

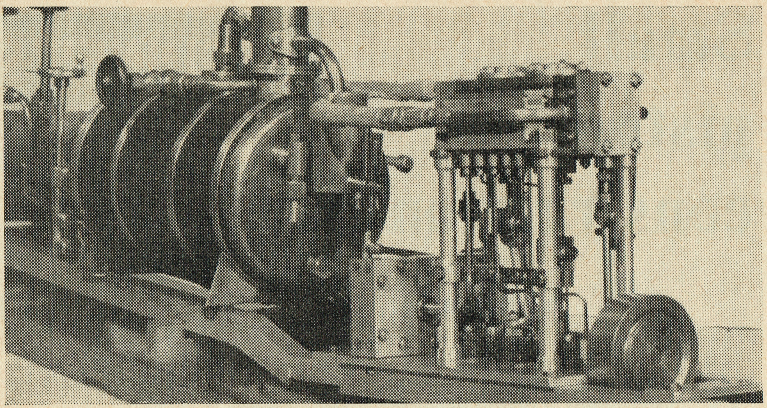
For an engine of moderate speed, a cast-iron piston is no less suitable than one of light alloy and may be machined to a closer fit in the cylinder. For the construction at *C* holes for the bosses are carefully drilled or bored; then the bosses are prepared, also from cast-iron bar, with a central step smaller than the bore of the bosses and the length of their distance apart. The piece is then drilled up carefully from each end nearly to the centre. The bosses having been bronze-welded in—with good fillets round them—the holes are continued inwards to cut the centre piece away; finally, the holes can be reamed.

On small pistons and where internal machining is necessary, a chucking piece on the crown is a considerable advantage. In the case of a two-stroke piston, this piece may also be used for holding in the vice while the deflector is filed and polished to shape as at *E* on the final operation. The material is gradually thinned until the piston is free when the last ragged edges can be cleaned up holding it in the hand.

Ring grooves are usually best machined before the final finishing cut on a piston, and may be retained square-sided by using left and right-hand tools as at *F*.

Piston clearances per in. of diameter for cast-iron cylinders may be: cast-iron, crown 0.003 in., skirt 0.002 in.; aluminium alloy, crown 0.006 in., skirt 0.003 in. ■





*Showing the engine lubricating system. The unconnected clack valve on the boiler was intended for a hand feed pump, which was never fitted*

# SERENA Part 2

**In this concluding article A. BRADDOCK deals with the boiler, firing and radio gear**

THE present engine is the third which has been attempted. The first, a Stuart No 10, was machined very hurriedly in one Christmas vacation in the engineering laboratories of a northern university; it was not successful due to lack of experience in machining.

The second engine, a V-twin, did not progress much beyond the drawing board stage, as the components proved to be too big to machine on my $2\frac{1}{4}$ in. centre clock lathe, which is not fitted with a boring table.

The third engine was successfully completed, and has had almost 50 hours' steaming to date. It is a double-acting slide-valve engine of $\frac{1}{2}$ in. bore and $\frac{3}{4}$ in. stroke. A twin-cylinder engine was preferred because of its self-starting powers. On occasions, the feed-pump bypass valve has been inadvertently left closed, and the boiler completely filled with water, stopping the engine with the boat in mid-pond.

Very soon, however, the water in the superheater vaporises and the engine restarts, the boat rushing along for a few yards at high speed, until the superheater again fills with water, when the boat stops. *Serena* eventually reaches the bank in a series of spurts, which invariably mystify onlookers!

The principal details of the cylinders and motion work are copied from one of LBSC's gauge 1 locomotives, but the cylinders are arranged vertically instead of horizontally.

Iron castings, for which I made patterns in wood, are used for the cylinder block and the two bottom cylinder covers, the rest of the parts being made from bar material. To cut down the weight, as much use as possible was made of aluminium alloy, the pistons, top cylinder covers, steam chests, cylinder columns and base plate being made from this material.

The crankshaft is built up from $\frac{1}{4}$ in. silver-steel rod, the webs being secured by pinning. Internal lubrication is provided by means of a displacement lubricator, and lubrication of the main crankshaft bearings and crosshead slides by a five-way wick-feed oilbox. The small pipes which deliver the oil are made from hypodermic needles, about 1/32 in. outside dia.

A gearbox giving $2\frac{1}{2} : 1$ reduction is fitted to the after end of the crankshaft, and from this is driven the boiler feed pump of $\frac{3}{16}$ in. bore and $\frac{5}{16}$ in. stroke.

Power is transmitted to the propeller shaft by means of a floating intermediate shaft of $\frac{3}{16}$ in. dia. stainless steel, which passes underneath the boiler. Case-hardened ball and pin type universal joints are provided at either end of this shaft. The propeller shaft proper, also of $\frac{3}{16}$ in. stainless steel, runs in a $\frac{3}{8}$ in. dia. tube with bronze bearings fore and aft. The tube is packed with grease by means of a small grease nipple which effectively prevents leakage of water round the shaft, and needs repacking only once per season.

At the forward end of the propeller shaft is a ball thrust race, which bears on a substantial bracket screwed to the keel. The propeller is machined from a bronze casting and is $2\frac{1}{2}$ in. dia. $\times$ about 4 in. pitch. It is three bladed.

## BOILER

The boiler, like the engine, is a third attempt, the first two proving unsatisfactory for various reasons.

It is a centre-flue type, 3 in. dia. and $6\frac{1}{2}$ in. long, and is constructed of copper throughout and silver soldered. In an attempt to improve the steaming of this type of boiler the flue is not continued right through the boiler, but turns upwards just short of the end and emerges from the top.

Six inclined water tubes of $\frac{3}{8}$ in. dia. are provided in the flue, which is $1\frac{3}{4}$ in. dia. Steam is collected from a small dome, passes through a stop valve on the starboard side of the dome, thence to a superheater of $\frac{3}{16}$ in. copper tube which passes down inside the vertical part of the flue, along the horizontal part, turns round the aftermost water tube, and passes forward again along the port side of the horizontal and vertical parts of the flue, emerging finally at the base of the funnel flange.

The superheater was inserted from the firing end of the boiler by passing both limbs of a U-shaped piece of $\frac{3}{16}$ in. copper tube along each side of the flue, and when they were visible at the base of the vertical part, seizing them with a pair of long-nosed pliers and drawing them upwards.

The ends were then manipulated

through holes previously drilled in the flange at the base of the funnel, and tube ends damaged by pressure from the pliers cut off. The general arrangement of the boiler is shown in Fig. 5.

The boiler was tested hydraulically to 150 p.s.i. but it normally works at only 20 p.s.i. with the blowlamp flame turned well down. A greater pressure results in the speed of the boat being too high for realism.

The engine exhaust is delivered into a small brass drum before passing up the funnel. This drum serves to separate condensed water and excess lubricating oil from the steam, and is fitted with a small drainage tap which enables the accumulated contents to be periodically drained overboard via a short length of $\frac{1}{8}$ in. tubing delivering through the side of the boat.

## BLOWLAMP

This is a conventional torch type, burning petrol, and has a 1 in. dia. flame tube. The vaporising coil consists of four turns of $\frac{3}{16}$ in. dia. copper tube wound round the outside

other burners, I offer the following points for consideration.

I find petrol to be the most suitable fuel for vaporising burners. It vaporises readily at a low temperature and is not prone to clog the coils of the burner with carbon particles formed by decomposition of the fuel, as has occurred with paraffin-fired burners I have constructed. Unleaded petrol, that is petrol free from additives should be used.

If the fuel container is placed close to the burner a good deal of heat is radiated from the burner to the tank,

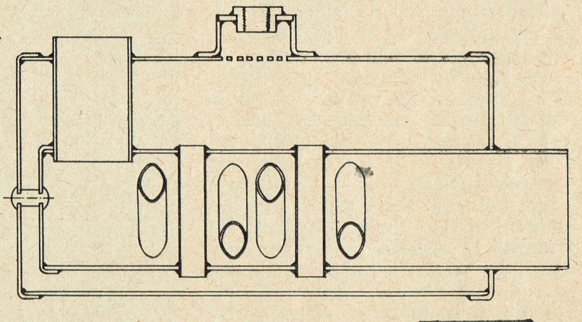
of the fuel, the flame alternately flaring up and dying away in a rhythmical and disconcerting manner!

The whole of the power plant is mounted on a framework of $\frac{1}{2}$ in. angle duralumin, which is secured to the keel by only two 2 BA setscrews. This enables the whole plant to be rapidly removed as a unit from the boat for cleaning after sailing, or for bench tests.

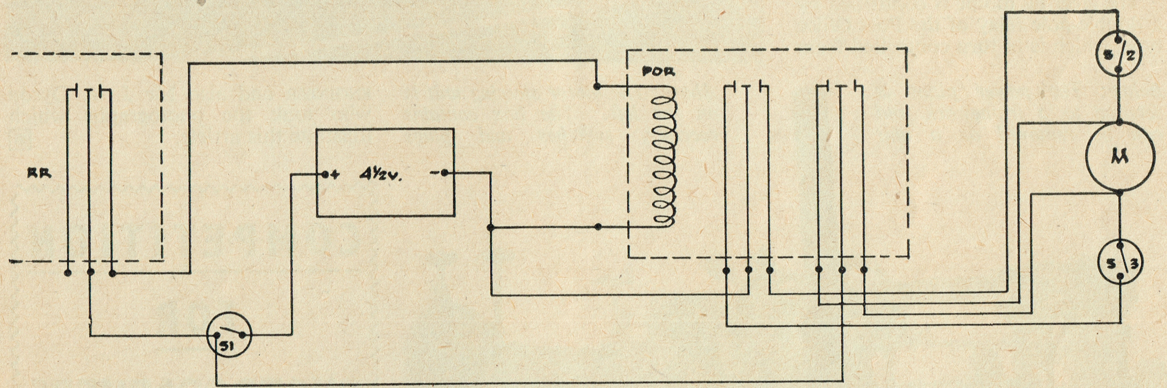
## RADIO GEAR

No provision was made in the original design for a radio control

*Right, Fig. 5: Longitudinal section of the boiler*



*Below, Fig. 6: Connections of the rudder motor.* m *steering motor*; por *Post Office relay*; rr *receiver relay contacts*; s1 *servo switch*; s2, s3 *rudder limit switches*




of the flame tube. A valve is fitted immediately behind the nipple, and controls the size of the flame, and hence the speed of the boat.

The fuel container is cylindrical, and holds about 8 oz. of petrol, which steams the boat at full speed for 60 min. or at a reduced speed for $1\frac{1}{2}$ hrs. The container is silver soldered up from sheet copper, with flanged ends, and is provided with stop valve, combined filler and air release valve and a connection with foot valve for a cycle pump, which is used to provide the air pressure.

This design was adopted after a good deal of experiment and its disadvantage is the roaring noise of the burner. I was unsuccessful in attempts to produce a silent burner suitable for an internal flue boiler. As a result of experiences with this and

and partially vaporises the fuel, thus maintaining pressure in the tank for long periods and greatly increasing the intervals at which pumping is necessary. I feel that it might be possible to produce a self-pressurising burner on these lines.

In attempting to regulate the size of the flame, it was found that the regulating valve must be placed between the nipple and the vaporising coil, and not on the tank or between the tank and coil. Valves in this latter position serve as stop valves only, and must be kept either fully open or fully closed, and must have through passages of at least the same cross-sectional area as the tubing of the coil.

Any restriction of the fuel flow here, such as by a partially open valve or a fitting with inadequate passage ways, causes violent surging

system, and the power plant was arranged to occupy most of the available space. When the rest of the boat was complete it was decided to fit a radio-controlled steering mechanism and it had to be arranged to fit in the few inches of space available at bow and stern.

I am indebted for the idea for the method of control to Mr J. Thompson of the Manchester Group of the International Radio Controlled Models Society. The system is admittedly crude, but simple and effective in operation and not very costly to build.

The two-valve transmitter and single valve super regenerative receiver are commercial articles and were purchased ready made. The system works as follows.

When a signal is emitted by the

transmitter, the rudder turns in one direction until it reaches maximum deflection. In the absence of a transmitted signal the rudder turns in the opposite direction.

To give a straight course, the transmitter is keyed intermittently twice per second by a master clock contactor (Government surplus article). A three-position switch of the Post Office type is connected to select either continuous signal, intermittent (pulsed) signal, or no signal at all. and is mounted in a small tin box convenient to hold in the hand.

The rudder is actuated by a Taplin 4½ v. motor driving through a double reduction worm and spur gear mechanism, the gears for this being obtained from an Air Ministry surplus air position indicator. A small pin projecting from the underside of the pinion fitted to the rudder head is arranged to operate cut-out switches when the rudder reaches maximum deflection at about 35 deg. of helm.

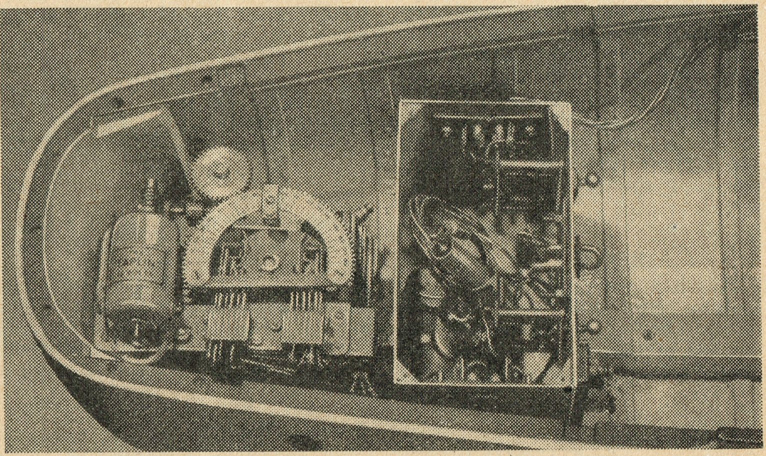
The steering motor is controlled by a double-pole relay of the Post Office type, which is in turn controlled from the receiver relay. The Post Office relay coil is energised from the motor battery. It is, of course, possible to dispense with the intermediate or slave relay and to control the steering motor direct from the receiver relay contacts, but this means using two batteries for the motor.

I find the three batteries at present used (h.t. and l.t. for the receiver, and 4½ v. bell battery for the motor) quite enough to cope with, as they all run down at different rates. The complete wiring is shown in Fig. 6, where the receiver relay contacts are represented on the left.

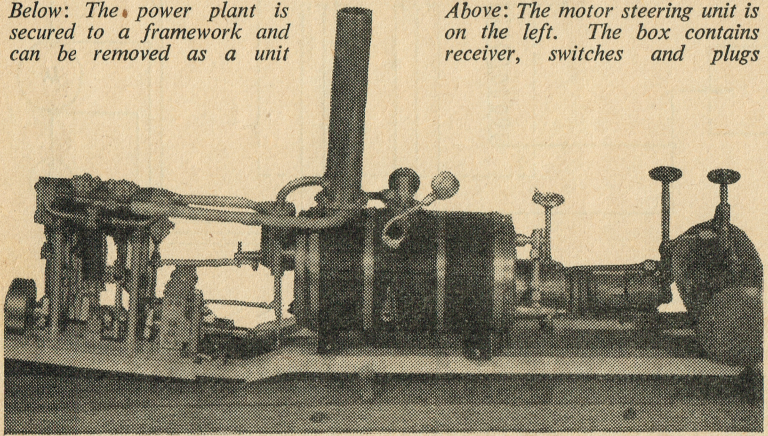
The steering unit, comprising motor, gearing and intermediate relay, is secured by two screws to a flange on the rudder head, and can be removed complete and replaced quickly by a small hand-steering wheel in the event of radio failure.

All leads are braided together, and connected to plugs in the various units. The radio unit is enclosed in a small box placed immediately forward of the steering unit and contains the receiver and switches, aerial connection, sockets for the test meter, and also sockets for the plugs from the steering unit and power supply. The batteries are carried under the foredeck.

Obvious improvements will at once suggest themselves to experienced radio enthusiasts, but I have described the system as fitted at present and hope to make alterations as time and experience permit. In any case, I regard radio control as a means of increasing the enjoyment to be obtained by sailing a boat and not an exercise in electronics as an end.



*Above: The motor steering unit is on the left. The box contains receiver, switches and plugs*



*Below: The power plant is secured to a framework and can be removed as a unit*

*Serena* was entered at the Northern Models Exhibition in Manchester in 1956, and I was very gratified when she gained the first prize in the power boat section. In the time when she was building, I received much helpful advice and encouragement from interested friends but I would like especially to mention the help in machining problems given to me by Mr H. T. Watson, of Oldham, who is known to many readers of MODEL ENGINEER and also Mr J. V. Dyson who took the photographs which illustrate this article. ■

## COMPETITION FOR PHOTOGRAPHERS

***Entries have started to arrive for the ME Photographic Competition, but many more are required. The competition is for readers' pictures of any aspect of model engineering and it will close on July 31. Entry is free, and the first prize will be £10, second £5 and third £3. In addition, 10s. 6d. will be paid for each other published in Model Engineer.***

***If the entries are of sufficient quality, a display of them will be made at the Model Engineer Exhibition (August 21-31). Full conditions and entry form are on page 35.***

# A LATHE made without a LATHE

**by L. S. KING**

THIS title may not seem, perhaps, a true description, because a number of turned parts can readily be discerned in the photograph of the nearly finished lathe, but all these parts were, in fact, obtained from a works junk store. I did not possess a lathe at the time.

It was the possession of these turned parts that inspired the initial decision to make a lathe, but at the end of the war, and for a time afterwards, there were no castings available, or for that matter, no facilities for machining them had they been obtainable. The second of these reasons would perhaps still be considered as relevant by a number of readers.

Access to certain piecemeal machining operations, as paid work, could be obtained at odd times in the works, and the proposition arose in my mind: "In lieu of work on actual lathe parts, could the accuracy of the works' machines be put to account and imported into the home construction of a lathe as a working commodity, on the basis of using whatever pieces of working material were available ?"

Sawing, planing and milling machines were the means by which the inherent accuracy was to be obtained, and steel channel, angle sections and steel plate were to be the main raw material. These were machined in overall lengths to avoid matching of individually machined pieces, but they were not machined to any particular finishing dimensions, the object being to obtain a source of finished stock with squared-up faces.

This avoided detailed instructions where none could be given in the nature of a casual job on the machine shops, and, of course, it materially reduced cost. Actual dimensions would start from the stock material for which the machined lengths were intended. Suitable pieces were then cut from this finished material as required.

The bed of the lathe was composed of two machined channel sections with the channels facing inwards in box girder fashion, held rigidly apart by further pieces of channel section, which also journalled a central leadscrew recovered from an old milling machine. The top gap in the bed between the main channel sections was closed by a length of strip material to exclude swarf from the leadscrew. A central leadscrew and swarf exclusion were considered to be very worth-while features.

The saddle was fabricated from other pieces of channel section and steel plate to make a form of box construction with good sliding fit over the bed channels, which were themselves of box construction. The leadscrew actuated the saddle by means of a hand wheel, a refinement which arose from the possession of the leadscrew.

The drive from the leadscrew nut was communicated to the saddle through the bottom plate of its box construction. For the purpose of holding both the saddle and the tail-stock rigid in a fixed position, clamping plates were fitted. These gripped the bottom surfaces of the bed by a clamping screw and handle.

As can be seen from the photograph, the headstock and tail-stock were fabricated from machined pieces of angle section. The mandrel of the headstock was some piece of Service equipment, the purpose of which was never ascertained, but the hollow shaft ran in phosphor-bronze sleeve bearings, and these recommended themselves. The tail-stock was made up from accurately sliding tubes, and it is believed that these can be obtained from makers of precision tube.

Other details can be gathered from the photograph and no further description will be given, as much depends on the fortuitous discovery of certain parts suitable for such as the headstock mandrel, leadscrews for saddle, slide rest, and tail-stock before dreams of a home-made lathe of this type could be made to materialise.

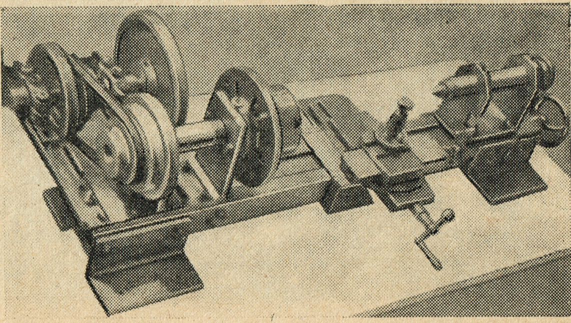
However, with such parts, and the facilities referred to, a very serviceable general purpose lathe can be constructed, if one does not expect too much of it. The cost of such a lathe is relatively low, but, of course, a fair amount of labour and time will naturally be required.

In general, no arrangements were made to take up wear, which itself is rather unlikely in such a lathe, but arrangements for adjustment for alignment were provided. By careful measurements and fitting, a gratifying alignment of the headstock and tail-stock was, in fact, obtained.

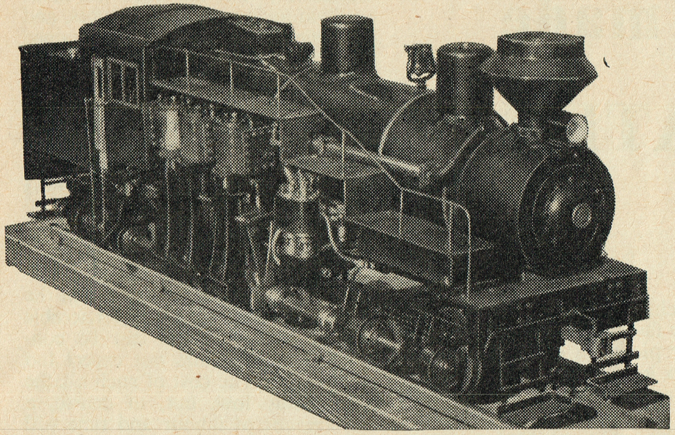
The main dimensions are: centre line to bed 4 in., between centres 13½ in., and as seen in the photograph, the lathe is equipped with a 4 in. self-centring chuck. It is equipped for power drive with a countershaft assembly arranged to slide in channels at each end of the countershaft.

At the time of the photograph, the belt tensioning gear had not been fitted. The motor was placed below the lathe so that the countershaft could move on a small arc struck from the motor shaft as centre, and no tensioning of the motor belt was required.

Although it is unlikely that anyone making up such a lathe, primarily from whatever suitable parts can be obtained, would produce exactly what is shown in the photograph, the general construction may give inspiration to others for a similar lathe having sufficient rigidity and accuracy for a general utility sort of work. ■



*Partly-built lathe, showing the belt and pulley drive*



# A COWBOY ENGINE

**ERIC COLEBY built this fine-looking Shay geared locomotive which, true to her prototype's transatlantic tradition, boasts good pulling power**

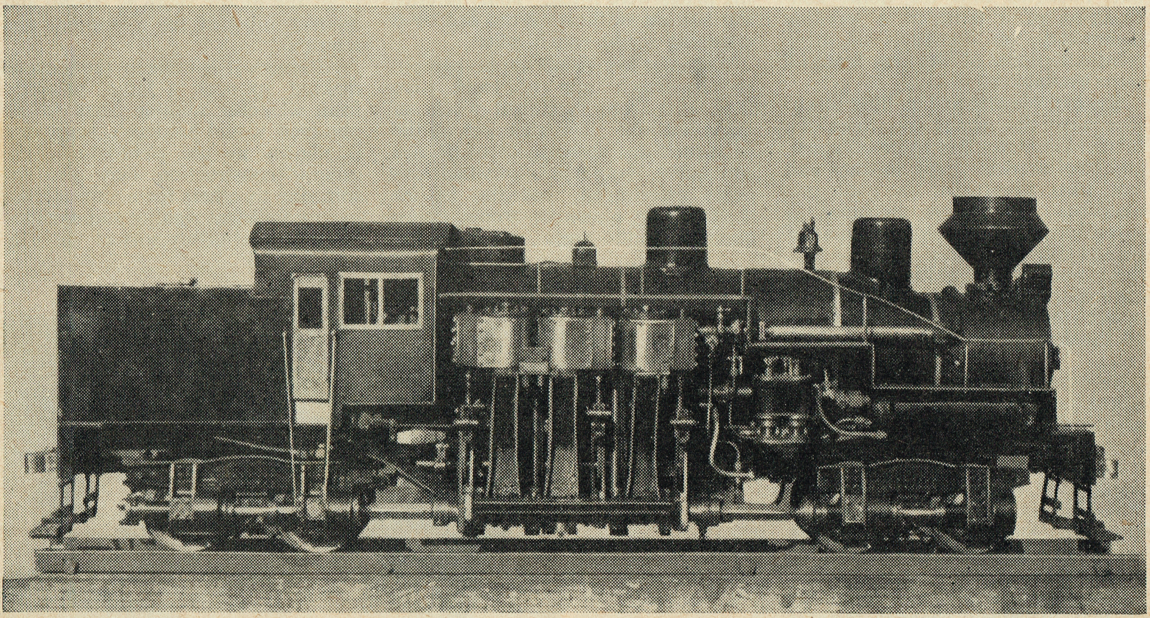
THE construction of this locomotive was inspired by a desire to design and build an engine "off my own bat" and by an irresistible name: "The Greenbriar, Cheat and Elk Junction Rail Road"! I found a photograph and dimensioned drawings of a Shay-geared locomotive belonging to that company in a book at the Patent Office Library and I straightway decided to base my locomotive on it.

Notes were made of all the leading dimensions given on the drawings and others were scaled from them. The prototype has a tender carried on a four-wheeled bogie, the wheels of which are also driven by gearing through an extension of the main driving shaft.

When I came to drawing the whole engine to the scale of $\frac{3}{4}$ in. to 1 ft I realised how long and unwieldy the complete engine would be, so I decided to cut out the tender and to enlarge the coal bunker and convert it into a water tank. Even so, the engine is 3 ft long overall.

The next problem that confronted me was the size of the cylinders. The three-cylinder simple engine of the prototype has cylinders 17 in. bore × 18 in. stroke. Scaled down to $\frac{3}{4}$ in. scale they would be $1\frac{1}{8}$ in. × $1\frac{1}{8}$ in. The capacity of three cylinders of this size was so much greater than two cylinders of a normal locomotive built to this scale that I decided on something smaller—1 in. bore × 1 in. stroke—for which castings were available from an advertiser. (The cylinders and the wheels on the left-hand side of the locomotive were the only castings used; the rest of the locomotive was fabricated.)

The foundation of the engine is a piece of $\frac{3}{16}$ in. × 3 in. steel plate placed vertically and bolted to two arms forming part of the main frames. As an additional support, the cylinders are carried on brackets mounted above the frame. The valve gear is Stephenson link motion and reversing is by a lever in the cab working through universal jointed levers to the reversing arms. The most troublesome



feature of the engine was the crankshaft, 8 in. in length. I made three before being completely satisfied.

The next item was the frame. This was constructed of 1 in. × 1 in. × $\frac{1}{8}$ in. steel angle suitably braced to carry the engine and to prevent twist. The prototype has narrow girders strengthened by rods—rather like a coach frame—but as this form of construction did not look quite right I planted on to the vertical sides of the angle the girder plates which are clearly shown in my pictures.

These plates have certainly improved the look of the locomotive and are in keeping with some of the heavier Shays built by the Lima Locomotive Company.

Construction of the bogies was the next step. This involved the provision of the four pairs of bevel gears. I was fortunate in getting, through an advertiser, some steel wheels of just the type I wanted.

The gear ratio is about 5 to 3. The shafts carrying the smaller bevels are carried in long bearings attached to the bogie frames and are coupled together by steel and rubber couplings. Springing of the bogies is contained in a box-like structure across the bogies and the kingposts are offset in relation to the centre line of the frame. The axle boxes on the right-hand side are fixed, but on the left-hand side they are in guides and have a very limited movement.

The couplings between the bogies and the engine shaft are flexible and extensible to allow for displacement on curves. At the front end of the engine shaft the coupling carries a worm which meshes with a 30 t. wheel driving the oil pump.

The boiler construction follows that of LBSC. The outer fire-box is 7 in. long × 5 in. dia., tapering to $3\frac{1}{2}$ in. at the bottom. There are 15 $\frac{7}{16}$ in. dia. tubes and three 1 in. dia. flues for the superheater. The grate at the front end is 3 in. below the bottom row of tubes, so there is plenty of space for a good fire, and the barrel is parallel, $4\frac{3}{8}$ in. dia. × 12 in. long between the tube plates.

The total heating surface of the fire-box tubes and flues is about 460 sq. in. added to which are about 60 sq. in. of superheating.

The cab contains the usual fittings. The regulator lever is the push-pull type connected to the regulator attached to the engine. Forward of the engine is a Duplex pump, which takes the place of the Westinghouse brake pump on the prototype, and the air container under the gallery is used as the oil container.

The spark-arresting chimney is a dummy. The head lamp is lit by a battery concealed under the left-hand frame. Buck-eye couplings are fitted front and rear and are worked by rods and levers on the buffer beams, but the coupling at the rear end is pivoted on a hook and can be dropped for running on the track.

I have not had time to make any extensive trials but from what running I have done the locomotive displays a surprising turn of speed, and she has plenty of pulling power. My chief trouble is to get enough water into the boiler; the present pumps seem to be too small.

**Shay note**: The title of this article originates from the remark of a small boy who was passing my club when I was firing up one day. "Oh, look," he said to his companion, " there's a cowboy engine." ■

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# Oils that resist radiation . . .

WHEN initial schemes for atomic power stations were being considered several years ago, it was realised that lubricants containing special properties would be required—the most important being those with resistance to atomic radiations.

To this end a programme was jointly set up by the Shell Thornton Research Centre and the Atomic Energy Research Establishment at Harwell.

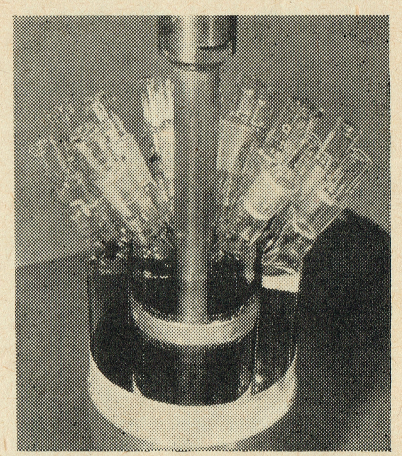
A very large number of materials—including a variety of synthetic as well as petroleum lubricants—have been exposed to various dosages both of gamma radiation and neutrons. Subsequently, an examination of the samples showed that many had undergone profound changes in molecular structure and physical properties.

For example, certain conventional petroleum lubricants rapidly darkened in colour and increased in viscosity with increasing dosage of irradiation. They eventually became transformed into jelly-like masses with melting points in excess of 220 deg. C and largely insoluble in petroleum spirit, cyclo-hexane, benzene, acetone ethanol and ether. Similar effects were observed with some synthetic diesters and silicones.

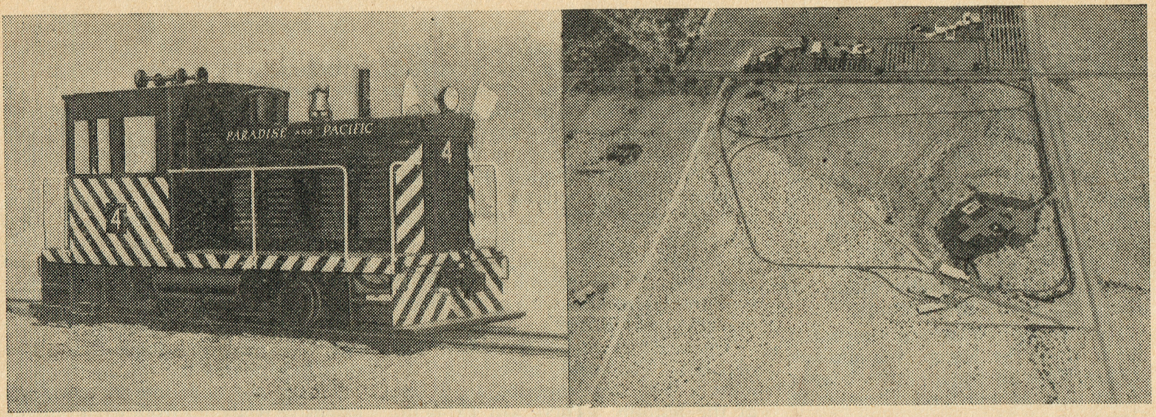
This research work was planned principally to obtain information on the influence of molecular constitution of stability towards atomic radiations, and already lubricants have been developed which show practically no change in physical properties at radiation dosages which transform many lubricants into solids.

In addition to resistance to radiation, other properties are required in the lubricants for equipment of nuclear power stations. For instance, contamination of the reactor cannot be tolerated, so that any lubricants which might come in contact with the coolant gas of the reactors must have an extremely low vapour pressure. Also, the lubricants must in some cases be capable of withstanding high temperatures for long periods since it may be possible to renew the lubricants only at the intervals of several years. With this type of reactor there is also the problem of compatibility of the lubricant with hot coolant, e.g. carbon dioxide under high pressure.

As a result of research work in which the Cobalt 60 source has played its part Shell have developed a number of special lubricants which meet the requirements of the nuclear power stations now being built for the Central Electricity Authority. Research is continuing to develop lubricants still more resistant to radiation which will be required in future for more advanced designs of nuclear power plant. Promising results are already being obtained. ■



*Some of the equipment used in the development of the new lubricants* [Shell picture]



*The miniature system's workhorse model of a 44-ton industrial switcher weighing 3,200 pounds, with a bird's eye view of the line*

# PARADISE and PACIFIC

***A pictorial feature on a unique American miniature railway system presented by MICHAEL LORANT***

GUY Stillman, who lives near Scottsdale, Arizona, and his family—he has three boys aged ten, eight and five—are the owners of a unique model railway system called the Paradise and Pacific Railroad. The track, which is $1\frac{1}{4}$ miles long, is laid out on the Arizona desert and is equipped with an undersized diesel locomotive hauling a perfect miniature train around a loop at 25 miles per hour !

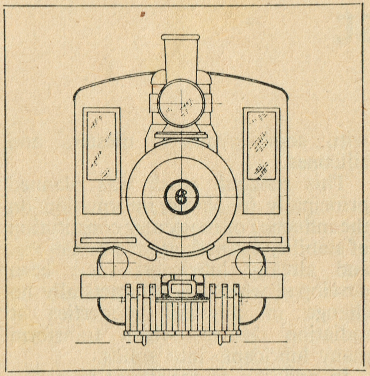
Mr Stillman has been interested in locomotives all his life and has been engaged in model building for 20 years. He owned a $7\frac{1}{4}$ in. gauge ($1\frac{1}{2}$ in. scale) layout from 1935 to 1941 when military service forced him to dispose of his steam locomotive and rolling stock. Ever since he has looked forward to operating a new model layout of a size to accommodate people.

His ambition began to take shape about six years ago when he was able to start on his Paradise and Pacific project. The miniature locomotive and all the rest of the equipment is scaled at *five inches to the foot*—almost half full size. The track of the new layout is 15 in. gauge and the cars 40 in. wide × 12 ft long. Brakes are automatic air, couplers are type D automatic. The cars are of wood—oak—construction with spring-loaded draft gear to absorb shock, and trucks are cast iron with chilled wheels 14 in. dia.

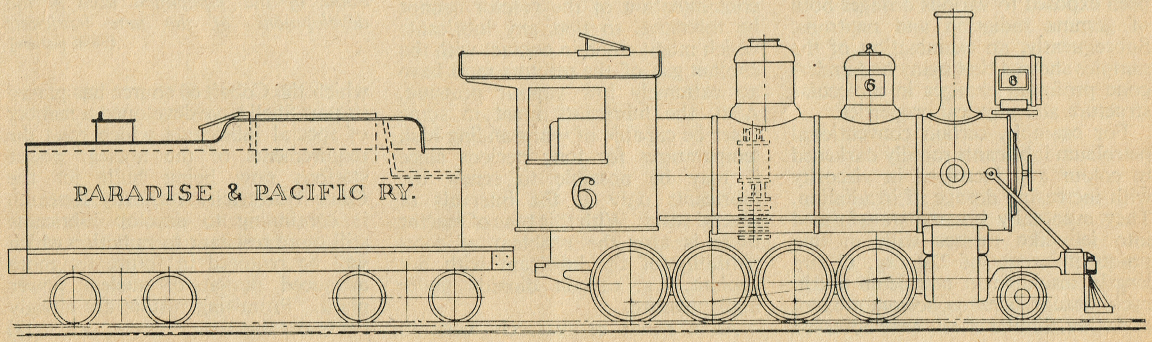
Among others, Mr Stillman has duplicated a tank car of the Colorado and Southern Railroad, two gondola cars of the Rio Grande Southern Railroad as well as of the Denver and Rio Grande Western Railroad and a lively red caboose of the Denver and Rio Grande Railroad.

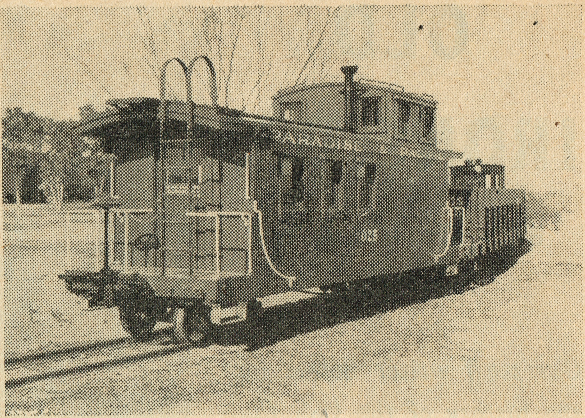
The heart of the whole system is his locomotive, modelled after a General Electric 44-ton industrial switcher. The locomotive weighs 3,200 pounds and operates with a Crossley petrol engine of 20 horse power.

A 30 m.p.h. contact machine is utilised for errand jobs, giving all the service that a real-life railway system can ever be expected to give. ■




*Above and below: Front view and side elevation*

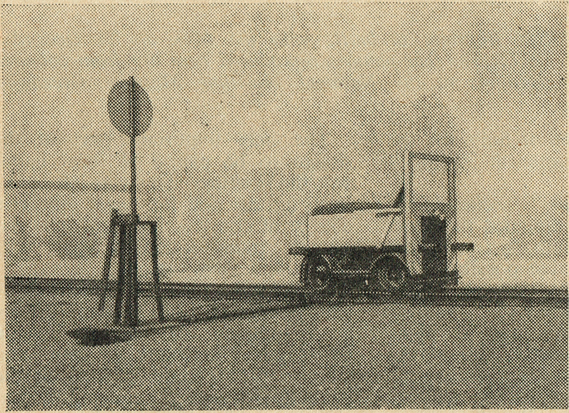


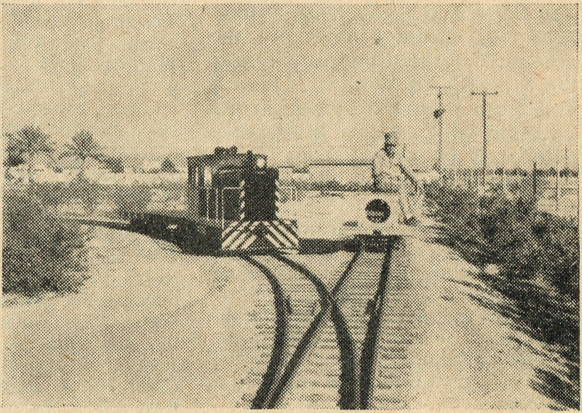


*Above*: The lively red caboose

*Top left*: Miniature gondola car made on the pattern of the Rio Grande Southern gondola cars

*Left*: This tiny contact machine runs at 30 m.p.h. on errand jobs

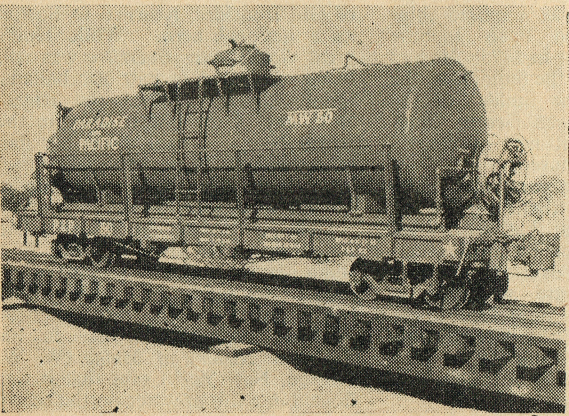


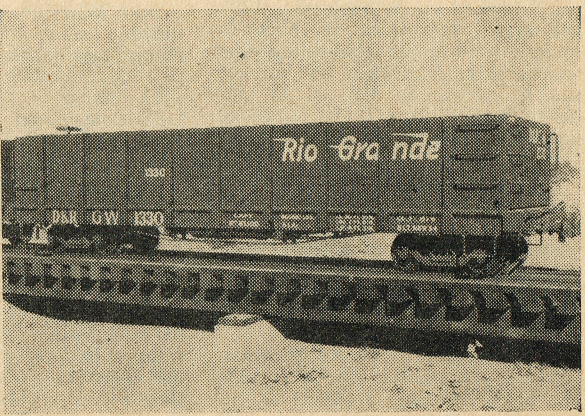


*Right*: Mr Stillman with his industrial switcher. It weighs 3,200 *pounds*

*Below right*: Miniature Rio Grande gondola car. It can hold ten persons easily

*Below*: The system's tank car

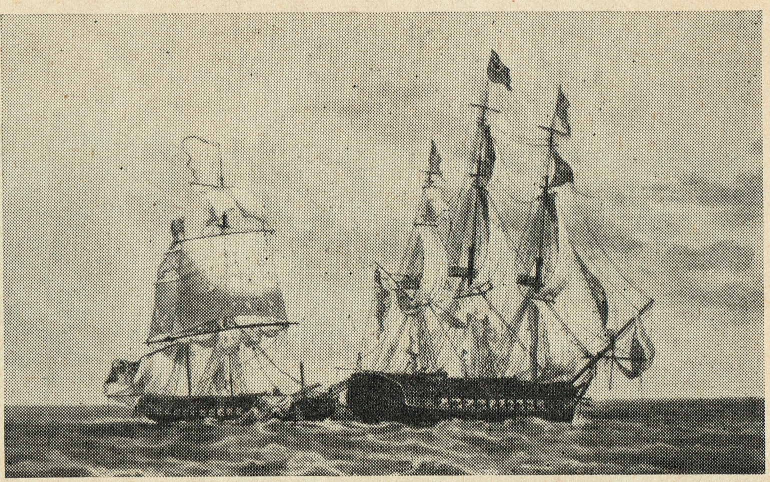




# OLD IRONSIDES

**by JOSEPH MARTIN**

*Our staff writer delves into the history of the USS Constitution and discovers that her reconstruction was based on a model*



*Old Ironsides in battle with the* JAVA *on 29 December 1812. The four pictures reproduced here are from coloured aquatints at the National Maritime Museum, Greenwich*

One hundred and sixty years ago, in the freshness of the American winter, Thomas Cooper of Newcastle, in Maine, and his friend Gray from Whitefield were cutting timber on the north side of the Augusta road near the township of Windsor. Half a mile from Bryant's Corner, in the direction of Cooper's Mills, they felled tall trees for masts for a ship which was being laid down in Boston.

The trail was cleared to Puddle Duck and the trees were hauled along it to the Sheepscot. In the spring of 1797 they were floated down to Wiscasset where Government agents yoked them at both ends with pieces of white oak slipped through mortises. They were then towed the rest of the journey.

When the frigate *Constitution*, affectionately known as Old Ironsides, was launched on 20 September 1797 her masts, like those of Nelson's *Victory*, were of the great white pine from Maine. The white oak for her keel had grown in New Jersey and her timbers of live oak and red cedar had been brought all the way from Georgia in the South.

I give these details because they may suggest the fullness of our knowledge in this matter of Old Ironsides. American scholarship is overwhelmingly thorough, and when the field happens to be New England we are not likely to suffer from any shortage of facts.

In MODEL ENGINEER correspondence columns on March 14 this year H. T. Crittenden, of Norfolk, in Virginia, a designer of hulls for the U.S. Navy, was quoted at length by John H. Ahern.

"No one knows," declared Mr Crittenden, "who designed the ships *Constitution* and *Constellation*. There is some indication that possibly John Wharton might have done so. They were *not* designed by Josiah Humphreys, who submitted the plans to the Marine Committee. Humphreys was a poor draughtsman as subsequent plans testify, while those of the ship in question were excellent."

I am afraid that Mr Crittenden has confused the American Navy of 1793 with the Navy of 1775. While we cannot say for certain who produced each element in the design of *Constitution*, we know perfectly well that the work lay between two men: Joshua Humphreys (not Josiah), the Chief Naval Constructor, and Josiah Fox, his assistant. The plans were drafted largely by men who are well known and who signed the drawings.

John Wharton was a retired shipbuilder who had been Joshua Humphreys' partner in 1775. He had nothing to do with the building of the 1793 vessels. The builder of the USS *Constitution* was George Claghorn, and he built her, of course, in Boston, Massachusetts.

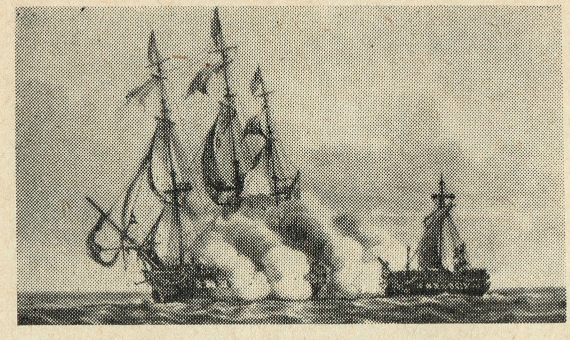
Several paintings, considered to be reliable, show the frigate as she was before 1812, the year that war opened with Britain. It can be easily established that the moulds used for cutting out her frame were all made in Joshua Humphreys' mould loft under his supervision. These moulds were shipped to Boston from Philadelphia and there is no reason to believe that they were discarded.

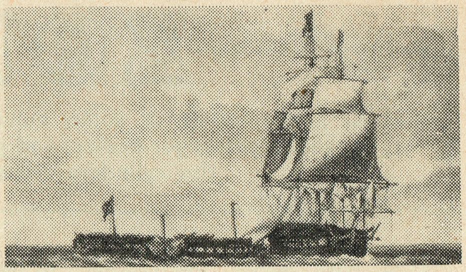
The only important part of the design to be placed in local hands was the masting. This was left to the local builder and the naval officer in charge of construction, and it is not known today exactly what spar dimensions were used.

I owe these facts—all except those which concern the timber—to the great kindness of Marion Vernon Brewington, assistant director and Curator of Maritime History at the Peabody Museum in Salem, Massachusetts. The Peabody has, in an honoured place, the model of Old Ironsides which was presented to Captain Isaac Hull after his epic defeat of HMS *Guerrière*. Captain Hull in turn gave it to the East Inida Marine Society, and today we find it in the East India Marine Hall of the museum.

Now, this gift was made in 1813, and in January of that year Commodore William Bainbridge, who had succeeded Isaac Hull in command of Old Ironsides, returned to Boston as a national hero. While Hull's great victory over *Guerrière* was still being celebrated in patriotic ballads, Bainbridge had forced the frigate *Java*, one of the fastest ships in the Royal Navy, to haul down her flag in surrender. There were, of course, more rejoicings with testimonial dinners in various towns.

Such a dinner to Commodore Bainbridge was given by the East India Marine Society. As one would expect, the model of Old Ironsides had a proud share in the rejoicings. William Hutchinson Rowe in his *Maritime History of Maine* (W. W. Norton, New York) says that it was floated in a tub of water on the centre





*Nothing is now left of the* JAVA *but a hopeless wreck*

*Left*: *The* JAVA *at* 4.35 *p.m. on* 29 *December* 1812

table. Just having the model there was, however, not enough. The model had been fitted with guns—Old Ironsides was designed to carry 44—and it seemed an excellent idea to fire them in salute. They were accordingly charged and at the right moment were touched off.

Unfortunately the broadside shattered part of the rigging. The repairs were later carried out by British prisoners of war lodged on a ship in Salem harbour, and the task, for all the odd irony that surrounded it, was discharged so well that the model in its final state came to serve as the main guide for the reconstruction of Old Ironsides herself in later years.

Consequently the ship modeller who follows the instructions given by B. G. Phillips in 1957 is indebted in part to those otherwise forgotten British sailors who, as prisoners far from home, had modelling thrust upon them and were so caught up in it that their only concern (I like to think) was the craftsman's pursuit of perfection, an instinct which lifts men above frontiers.

The model in the Peabody Museum, Mr Brewington tells me, " is equal in all respects to the finest ' Admiralty ' work." Of the modeller himself no record exists; he has left us an historical masterpiece but not his name.

Perhaps he was one of the humble seamen who lined the deck of Old Ironsides on that July day in 1798 when she sailed out of Boston, with flags flying and guns mounted, on the first voyage of her heroic career. She made a sight to stir the heart. Her main mast rose 233 ft, her foremast 200 ft. and her mizen mast over 180 ft, and in full trim she presented no fewer than 72 sails to the wind—about 43,000 sq. ft of canvas, or almost exactly an acre.

Here was a ship, indeed ! Let me give you a few more statistics, though only poetry, only the high craft of a Masefield, can bring her alive on paper. Her average speed, then, was given as 12 or 13 knots; her tonnage was about 2,000; her length was 204 ft, with 175 ft on the water line; her beam was 43 ft 6 in. and her draught averaged 22 ft. The oak of her armour was about 1 ft 9½ in. thick, and the big guns on her main deck—she often carried more than 44 guns in all—were 24-pounders nearly 10 ft long. By a stroke of historical aptness the copper sheathing below her water line had come from the shop of Paul Revere, the almost legendary American hero whose dramatic ride through the night to summon the Minute Men was the first high bugle call of revolution.

All lovers of old sailing ships are interested in their figureheads. Old Ironsides carried a bust of Hercules until it was splintered by a shell fragment when the Americans—worried, even then, by the Middle East—were attacking the pirate stronghold of Tripoli. Neptune followed; but in the course of time the sea, I am sorry to say, proved too much for the sea-god and Old Ironsides was left for a spell without anything more decorative than a billet, a large wooden block carved in a curlicued scroll.

The third figurehead, in complete contrast with the Greek gods which had preceded it, was a contemporary statesman wearing the frock coat of the time and carrying, like all statesmen in nineteenth century statues, a dignified roll of manuscript. Captain Jesse D. Elliott, who commanded the frigate in the 1830s, had hired a woodcarver to cut a full-length figure of President Andrew Jackson.

To us this intention may seem innocent and laudable, but the President of the United States, as the Americans are perpetually reminding each other, is also the representative of a political party. The people who did not admire Andrew Jackson or support his policies were quick to show their anger and to protest that a ship of the Navy should not be associated with the head of one party or another.

Undeterred, Captain Elliott went boldly ahead and placed a guard on the figurehead while it was being carved and after it had been completed and fixed. At this point, when angry posters were appearing in Boston—" Freemen awake, or the Constitution will sink ! "—Sam Dewey, a young sea captain in the service of William Lincoln, a Boston merchant, happened to return from the West Indies. The merchants and shipowners of Boston were strong opponents of President Jackson, and in the course of talking about the figurehead Lincoln declared that he would give a hundred dollars to see it removed.

On the night of 2 July 1834, a fierce thunderstorm broke over Boston and no one on board Old Ironsides, or in the warships moored protectively on either side of her, noticed a rowing boat cross the Charles River from the Boston bank to the Navy Yard. Still unseen by the guard, Sam Dewey reached the frigate's bow, climbed up a rope, and made his way along the bowsprit. With him he had a number of tools, including a saw and two gimlets. Having screwed a gimlet into each side of the head he used the two as fasteners for a line passed over the bowsprit in such a way as to give him support. Then he went to work with the saw.

Saws make a noise, but there was plenty of thunder to help Sam Dewey that night and every peal set him sawing harder. Eventually the head came loose. Sam dropped it in his boat, baled out the water that had run down from the scuppers, and rowed back to the Boston side, having won the hundred dollars and set both the enemies and friends of Old Hickory a pretty puzzle until they learnt the full truth.

By the anti-Jacksonians Sam was dined as a hero. The authorities made no attempt to punish him and poor Captain Elliott could do nothing but order a new head for his carving. It was securely fixed and remained at the prow until a refitting many years later—one of various changes which Old Ironsides has undergone in her long history from 1797 to the launching ceremony on her 150th birthday ten years ago. ■

# ZOE

**LBSC gives details of some more components for the $1\frac{3}{4}$ in. gauge passenger-hauler, and goes on to explain how the cylinders are erected**

As with other locomotive features, there is a diversity of opinion about guide bars—or slide bars as they are often called. Some locomotive engineers swear by a type that others swear at! Personally, I haven't much preference; the reason why I am specifying the single-bar type is because they are about the easiest to make and erect and, on a locomotive with small wheels and horizontal cylinders, they are well out of the way of track dust and dirt.

Each bar is made from a piece of $\frac{1}{8}$ in. × $\frac{3}{16}$ in. steel—silver steel for preference, but mild steel will do if bright and smooth—the ends being squared off to a length of $2\frac{7}{8}$ in. Chuck each truly in the four-jaw, turn down $\frac{3}{16}$ in. of the end to $\frac{1}{8}$ in. dia. and screw $\frac{1}{8}$ in. or 5 BA to suit the tapped hole in the boss of the cylinder cover.

At the plain end, drill a No 34 hole and countersink it. When screwed right home, the bars should be parallel to the piston rods, with the wider sides at top and bottom.

## THE CROSSHEADS

Both crossheads can be made from one piece of $\frac{5}{16}$ in. × $\frac{3}{8}$ in. mild steel, about $1\frac{1}{2}$ in. long. The first job is to mill a groove $\frac{3}{16}$ in. wide and $\frac{1}{8}$ in. deep in one of the narrower sides. If a regular milling machine is not available, the groove can be formed by holding the steel in a machine vice—regular of improvised—bolted to the lathe saddle and traversing it under a $\frac{3}{16}$ in. saw-type cutter mounted on an arbor between centres.

The steel must be set at the right height to take out the $\frac{1}{8}$ in. depth at one cut. Run the lathe slowly with the back-gear in, use plenty of cutting oil, and don't force the feed. The result should be nice clean grooves in which the bars should be an easy sliding fit. The grooves can also be cut by end milling, the process being the same as described for the axle boxes.

On one end, at exactly $\frac{3}{8}$ in. below the bottom of the grooves, make a heavy centre pop, and chuck the steel in the four-jaw with this pop mark running truly—which is easy enough if you bring up the tail-stock with the centre in it for a guide. Centre deeply with a size E centre drill, and then put a No 23 drill right through. It must go through truly, so keep withdrawing it to clear chips, and use plenty of cutting oil.

Now square off each end in the four-jaw, and then part the piece in the middle, facing off the parted ends until each is $\frac{5}{8}$ in. long. At $\frac{1}{8}$ in. from the top, and $\frac{3}{16}$ in. from one end, mark off and drill the hole for the crosshead pin, which must go through dead square, so use either drilling machine or lathe, and don't forget that one right-hand and one left-hand are needed.

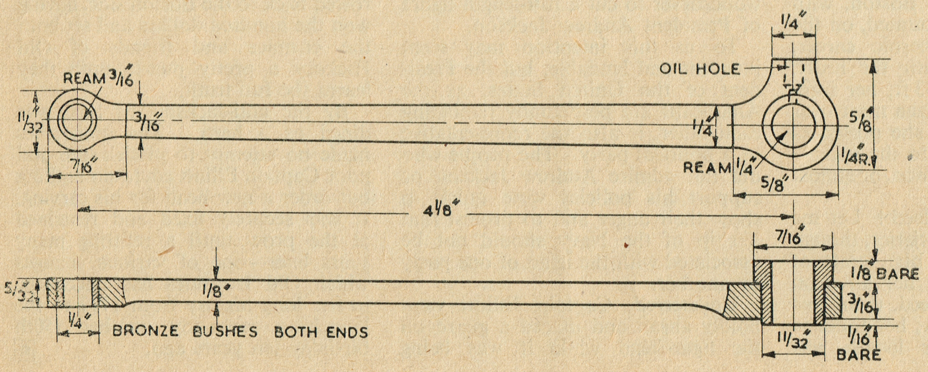
With a $\frac{3}{8}$ in. pin drill having a 5/32 in. pilot pin, form the recess for the little-end of the connecting rod; this should be 7/32 in. deep, as shown in the section. The crosshead can then be filed to the shape shown, the outline at the bottom following the edge of the pin-drilled recess.

The outer side is reduced for 1/32 in. starting at $\frac{3}{16}$ in. from the top. It doesn't matter if the piston-rod boss is left square, but it can be rounded off by driving a piece of round steel turned to a tight fit into the piston-rod hole from the recess end, chucking this in the three-jaw so that the boss is outwards and taking the corners off with a small roundnose tool set crosswise in the rest. If a 9/32 in. running-down cutter is available, the job can be done in two wags of a dog's tail, but it isn't worth while making one merely for two crossheads.

The drop-arm, or crosshead arm, is filed up from $\frac{3}{8}$ in. × 3/32 in. mild steel to the shape shown. Drill a No 21 hole in the larger end and drill the smaller end No 48 and tap it 3/32 in. or 7 BA. To hold it securely for brazing to the crosshead, chuck a piece of $\frac{3}{16}$ in. steel, face the end, and drill No 40 for about $\frac{1}{2}$ in. down.

Turn about $\frac{1}{8}$ in. length to a very tight fit in the holes in the crosshead and drop-arm, and part off two 5/32 in. lengths. Drive one into each crosshead, flush with the recess, and then drive on the drop-arms, setting each at right angles to the crosshead as shown. Smear a little wet brazing flux around the joints.

Stand the crossheads upside down on a piece of $\frac{3}{8}$ in. × $\frac{1}{16}$ in. mild steel strip, and apply some wet flux to each side. Now if the whole lot is heated to bright red and a bit of $\frac{1}{16}$ in. soft brass wire (or a $\frac{1}{16}$ in. Sifbronze rod) is applied to the joints, it will melt and penetrate. But a warning: be very sparing with either. If any gets in the grooves in which the guide bars fit, it is an exasperating job to clean it out, and if you try to do it with a small file the chances are that some of the steel will be filed away along with the unwanted brass, and the nice sliding fit then becomes a thing of the past.




*The connecting rod. Note the special wide big-end bushes for resisting wear*

The best advice I can offer is to cut a piece of silver steel of the same section as the guide bar, chuck truly in the four-jaw and face the end dead square, harden and temper the end to medium yellow, and use it as a drift to clear the hole. Insert one end in the obstructed hole, then put the lot between the jaws of the bench vice, with pieces of soft brass or copper between it and the jaws to prevent marking, and carefully squeeze the drift right through. If the bars fit too tightly a very slight easing of the hole with a small flat file will restore the *status quo*.

File away the superfluous metal at each side, flush with the top of the crosshead, and clean up. The hollow locating pin, which was used to hold the drop-arm to the crosshead while brazing, will be brazed in solid, but it is only a minute's work to open out the No 40 hole with a No 21 drill, and it is "as-you-were."

If any brazing material has managed to get into the recess, just put the pin drill into it again. All that then remains is to turn the little double-ended pin shown, from a piece of 1/8 in. silver steel, and screw one end of it into the tapped hole at the bottom of the drop-arm. It may be riveted over slightly where it comes through the arm, which will be good insurance against it coming adrift on the road.

For the main crosshead pin, or wrist pin, chuck a piece of 3/8 in. round steel in the three-jaw, face the end, turn 5/16 in. length to 5/32 in. dia. and screw 5/32 in. × 40. Turn the next 5/32 in. full, to 3/16 in. dia. and part off at 1/16 in. from the shoulder. This head will fit the pin-drilled recess and make the crosshead fully equal to an ordinary double-sided one. The nut is made from 5/16 in. hexagon steel and needs no detailing.

## CONNECTING RODS

The connecting rods are made from 5/8 in. × 3/16 in. mild steel. They can be machined up in the same way as the coupling rods, either by milling or sawing and filing. If a milling machine is available, cut the blanks to a length of about 5½ in. and coat one with the marking fluid mentioned in previous notes, then mark out the rod as shown, leaving the same amount of "overplus" at each end.

Drill 1/8 in. holes at the bush centres, then use the marked rod as a jig to drill the other one, and rivet the two together by pieces of 1/8 in. rod driven into the holes. The rods can then be clamped in a machine vice on the table of the machine and the marked line set level with a scribing block.

There will be a lot more metal to take out of the blank on the upper side of the rods where the oil box comes at the end, and my pet way of doing this is to use a slabbing cutter on a short arbor, the particular cutter I use being 2 in. dia. and having spiral teeth. The way it goes through mild steel, with a mixture of Cutmax and paraffin in equal parts dripping on it, is just nobody's business.

I can usually mill down to the diameter of the little-end boss at one cut, taking the cut along as far as the oil box at the big-end. To get the small radii at the places where the straight part of the rod meets the bosses, I use the side flutes of an end mill. My horizontal miller has a No 9 Brown and Sharpe taper hole in the spindle, and I have reducing sockets so that I can use both Nos 7 and 5. I have several end mills with taper shanks to suit, and as these vary from 5/16 in. to 3/4 in. it is easy enough to select one which will cut the desired radius at each end of the rod. This, mounted in a suitable socket, replaces the slabbing cutter; the blanks in the machine vice are fed up to it by raising the table and the milling completed to the marked line.

The blanks are then reversed in the vice and the other marked line set to the scribing-block needle. As there is only a little metal to take off on the underside of the blanks, the small cutter does the trick easily.

I also use the small cutter to thin down the face of the rods between the bosses. Owing to the taper, they cannot be held direct in the machine vice and, anyway, they would spring. Now here is where the extra length at each end comes in. They are clamped down to a piece of 1 in. sq. bar (held in the vice) by a bolt at each end bearing on the extensions. This enables the cutter to travel the full length required—right up to the bosses—while the bar to which they are clamped prevents any springing antics.

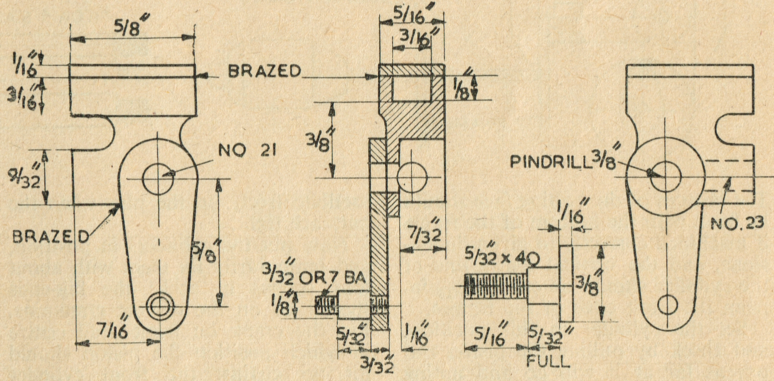
The bosses are rounded off on my vertical miller, but they can easily be done in the lathe. Turn a pip about 3/16 in. long on the end of a piece of 1/2 in. sq. bar to a diameter that will easily fit the holes in the bosses. Clamp this under the slide-rest tool-holder, level with lathe centres and parallel with the bed. Put the boss of the connecting rod over the pip, and run it up to the side flutes of an end mill about 3/8 in. dia. held in the three-jaw. Run the lathe slowly and swing the end of the rod around so that the end mill cuts away the superfluous metal around the hole.

If the extensions are sawn off first, close to the marked-out boss, the rounding-off only takes a few minutes. Be careful to avoid swinging the end of the rod around too far otherwise you will cut off the oil box!

The connecting rods can be shaped by hand, if clamped in the bench vice with the marked line just showing at the jaws. File a gap close to one of the bosses, wide enough to take a hacksaw blade lying on its side. Put the blade sideways in the frame and saw along until the other boss is reached, applying cutting oil with a brush. Saw straight down at the other boss and the piece will fall out, leaving very little filing to be done. Cutting oil on the saw blade makes it walk through the mild steel at a surprising rate.

The little ends are thinned down to 5/32 in. drilled 1/4 in. and bronze-bushed, the bushes being flush. I am specifying a little ruse with the big-end bushes—it proved a winner on my Webb compound engine—to get plenty of bearing surface.

Open out the holes to 11/32 in. dia. and fit bronze bushes with the flanges on the inside, as shown in section. This gives a bearing 3/8 in. wide, and




*Crosshead, drop-arm and pin*

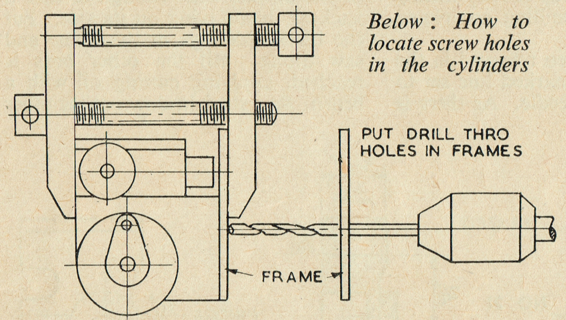
# Zoe . . .

with the $\frac{1}{4}$ in. dia. crankpin will stand up to the stress of passenger-hauling without undue wear provided that good-quality bronze is used, either drawn or cast.

Incidentally, I have tried white-metal bushes, but there doesn't seem to be any advantage—at least, not at the relatively slow speed at which the wheels of a little locomotive turn—compared with the crankshaft of an automobile engine.

### HOW TO ERECT THE CYLINDERS

A simple sketch very often conveys more at a glance than a couple of pages of text, and the reproduced drawing shows the method I always use when erecting outside cylinders. The location of the cylinders was shown in dotted lines on the drawing of the frame. They are horizontal.




*Below: How to locate screw holes in the cylinders*

The bottom of the bolting face should be flush with the bottom of the frame if machined correctly to given dimensions, and the vertical centre line of the cylinder should be exactly $3\frac{1}{16}$ in. from the front edge of the frames.

Set the cylinder in this position, and check by pulling the piston rod out as far as it will go and noting if it is in line with the centres of the axles, with the axle boxes in the running position.

Put a big toolmaker's cramp over cylinder and frames to prevent any movement. Then put a No 30 drill in the handbrace chuck, poke it through the screwholes in both frames as shown, and make countersinks on the bolting face of the cylinder. Remove the cylinder and put it in a machine vice, with the bolting face level with the tops of the jaws; then drill the countersinks with a No 40 drill and tap them $\frac{1}{8}$ in. or 5 BA.

They can be drilled to $\frac{3}{8}$ in. depth without any risk of piercing the cylinder bore. Repeat the operation for the second cylinder; but before making the countersinks, temporarily attach the first with two or three screws and check if both cylinders are exactly in line. I once saw a chassis on which the left-hand cylinder was 3/32 in. lower than that on the right, and over $\frac{1}{8}$ in. ahead of it ! The builder had complained that he had made his connecting rods to given dimensions, but they didn't fit—and no wonder.

Put the crossheads on the guide bars, and see if they fit tightly on the piston rods. They should need slight tapping to get the bosses over the rods; but if they won't go on, ease the holes in the bosses slightly with the "lead" end of a 5/32 in. parallel reamer. When the piston rods are in the bosses for about $\frac{1}{16}$ in. or so they should move freely for the full stroke, without any sign of the crossheads binding on the guide bars. Then put the little-ends of the connecting rods in the recesses and secure them with the crosshead pins. There should be just the tiniest amount of side play, and the rods should oscillate freely on the pins when the nuts are tight.

Now put the cylinders in position, and temporarily fix them with about four screws in each; the big-ends should be on the driving crankpins. Put the crank on front dead centre in which position the piston should hit up against the front cylinder cover. Take off the cover and very carefully drive the piston back 1/32 in. so that the rod enters the crosshead boss that much more.

The boss is then exactly at its right position on the piston rod, and can be pinned by drilling a No 43 hole clean through boss and piston rod, and squeezing in a piece of 3/32 in. round silver steel 11/32 in. long. Ease it slightly with a file at one end to give it a start.

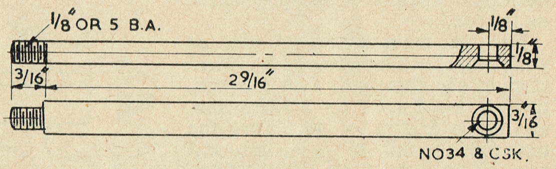
When both are pinned the wheels should turn freely by hand, without any sign of binding of the piston rods or crossheads. Setting the piston with 1/32 in. clearance at the front end of the cylinder as described, automatically gives the same clearance at the back end if the machining and fitting have been carried out according to the instructions. There is no need to put all the screws in the cylinder bolting faces yet, as the cylinders will have to be slacked off when erecting the steam and exhaust pipes.

Note—very important this—if *Tich* cylinder castings have been used that will not clean up to the full 1 in. from the bolting face to centre and have been machined to $\frac{7}{8}$ in. instead so that a $\frac{1}{8}$ in. packing piece could be used, locate the screwholes in exactly the same way, with the bolting faces against the frame. Then cut out two packing pieces from $\frac{1}{8}$ in. metal or fibre to the size of the bolting faces, clamp them to the frames in the same position as the cylinders and drill No 30, using the holes in the frames as a guide. Insert the packing pieces between the bolting faces and frames when temporarily erecting as described.

I might add that the idea of using a piece of fibre as a heat insulator is ancient history. Mr C. M. Keiller did just that when erecting the cylinders of his $2\frac{1}{2}$ in. gauge Great Western type locomotives 25 years ago, and I adopted it in my *Dyak* design.

● *To be continued*

*Guide bars. Simple to make, easy to erect*




## INDEX FOR VOLUME 116

THE index for Volume 116 (January-June 1957) is now ready and may be obtained from the Sales Department, MODEL ENGINEER, 19-20 Noel Street, London, W1, price 1s., post paid. Included with the index is the title page. Overseas readers should send an International Money Order for 1s. Binding cases for Volume 116 will be available shortly and orders can be booked now. The cost is 5s. plus 6d. postage. Stocks of binding cases for Volumes 114 and 115 are also available at the same price. Please state which volume is required when ordering.

# BOOK REVIEWS

CAMS: DESIGN, DYNAMICS AND ACCURACY. By H. A. Rothbart. (London: Chapman and Hall Ltd). 349 pages, 9 in. x 5¾ in., numerous line drawings, diagrams and photographs. Price 76s.

So many kinds of mechanism are critically dependent on cams for their successful operation that a sound working knowledge of cam design is highly desirable, if not essential, to every mechanical engineer and designer. Yet strangely enough, very little information on the subject has hitherto been available; standard textbooks on mechanics generally dismiss it with little more than a brief reference to basic principles and one or two illustrations of simple types of cams.

This book undoubtedly fills a long-felt want in giving an exhaustive and fully-up-to-date treatment of the subject, in all its aspects and applications. Chapters are included on basic and advanced curves, determination of cam size and profile, the dynamics of high-speed cams, force analysis, materials, stresses, and means of attaining accuracy in production and operation. The design of followers, cams having rotary, reciprocating and combined movement, polydyne cams and other special types are discussed.

Although, as befits an advanced work of this nature, a good deal of mathematics is employed in the analysis of phenomena and design calculation, the practical side of the subject is never far from mind, and the author never assumes the lofty disregard of actual practice which is all too common in the "scientific" literature of engineering. To anyone who is ever called upon to design a cam for a special and, more particularly, exacting purpose, the information given here will be invaluable.

KINEMATICS OF MACHINES. By Rolland T. Hinkle. (London: Longmans, Green and Co. Ltd). 231 pages, 5¾ in. x 9 in., illustrated by line drawings and photographs. Price 45s.

This book deals with the theory of mechanical motion, and the application thereto of physical laws and basic principles of mechanics. It begins with a chapter on terminology and basic concepts, followed by equations of motion and its transmission, velocity and acceleration. The practical application of these principles is then illustrated in chapters dealing with cams, rolling contact, gearing, flexible connectors, gear trains, screws and miscellaneous mechanisms. Problems are included at the end of each chapter, dealing with the particular subjects covered.

Some advanced knowledge of engineering mathematics, including calculus, is necessary to enable full advantage to be taken of the information this book contains; it is intended mainly for the theoretical student, and will be found a valuable aid in coping with the complex problems of modern mechanical design.

THE PRACTICAL WOOD TURNER. By F. Pain. (London: Evans Bros Ltd). 166 pages, 5½ in. x 8½ in., illustrated by drawings and photographs. Price 12s. 6d.

For the production of both useful and ornamental articles, wood turning offers many attractions; it can be carried out with relatively simple equipment, and its rudiments, at least, can be acquired fairly easily by anyone conversant with the use of hand tools. The author of this book is well known to ME readers, having been a regular demonstrator at the ME Exhibition for several years, and few of those who have witnessed the way in which he can produce beautiful work amid a fountain of wood chips have not been inspired to go and do likewise.

In this book he gives the lessons of a lifetime of experience in all branches of the craft, including advice on tools and equipment, and their application to various processes. Some of the methods are distinctly individual, such as we have not seen described in any previous work on this subject; these include recommendations for tool shapes, and sharpening methods, but there is no question of their practical effectiveness. If there is anything to criticise in the book, it may be ascribed to the fact that Mr Pain, in common with many craftsmen, is far more at home with the tools of his trade than with the pen.

ADVANCED FLUID MECHANICS. By R. C. Binder. (London: Longmans, Green and Co. Ltd). 426 pages, 5½ in. x 8½ in., illustrated by line drawings and photographs. Price 60s.

As it name implies, this book deals with the theoretical aspects of fluid motion; it is divided into three main parts, the first of which deals with first principles in fluid mechanics, the second with the application of these principles to hydraulic and pneumatic machinery, and the third with more complex principles, including vibrations in fluids, viscous, compressible and incompressible fluid flow.

The practical examples of fluid machinery described include axial-flow and centrifugal fans, pumps and compressors; fluid couplings and torque converters; jet compressors and jet pumps; and fluid turbines. Mathematics and trigonometry are extensively used throughout the book, which is intended for the advanced technical student and designer. Each chapter concludes with selected problems, and bibliological references.

THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC, 1957. Published by Henry Greenwood and Co. Ltd. Price 6s.

This comprehensive work is of considerable value to photographers and should find a place on the bookshelves of all professionals and many amateurs. A valuable feature this year is a section which deals at length with electronic flash factors and developing times.

POST OFFICE GUIDE (new edition). From any post office, at branches of HM Stationery Office, or through any bookseller. Price 2s. 6d.

Are you thinking of ringing a relative in Rhodesia? What can you send to a friend in Fiji? These questions could be important for you.

If you are sending parcels or letters to any of the 101 places overseas, do you know the cost of postage, the transmission time and frequency of service? Do you know goods that cannot be sent to these countries?

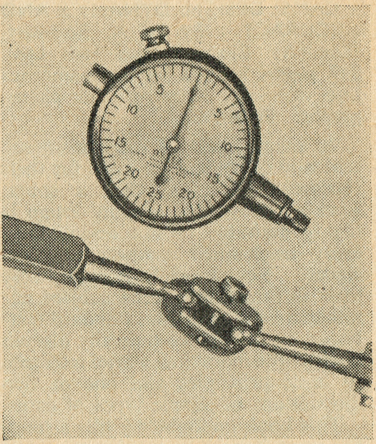
Do you know that postage stamps issued in the reigns of Queen Victoria and King Edward VII may no longer be used for prepayment of postage, or that postage stamps may be perforated with initials provided that the perforating holes are no larger than those dividing one stamp from another in a sheet of stamps?

Or maybe, at some time or another, you will want to use the radio telephone service which is available through Post Office coast stations to trawlers, coasting vessels and other small ships. How do you get in touch with them and what are the relative charges?

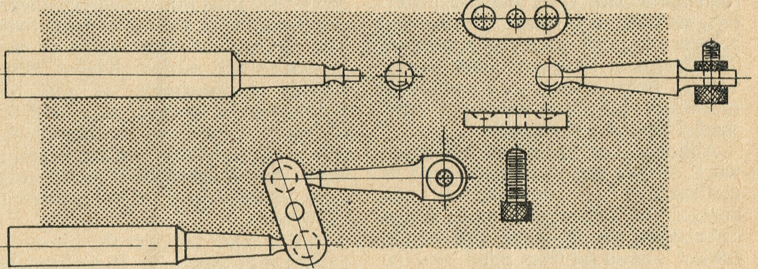
Answers to this sort of question can be obtained from the Post Office Guide which contains 500 pages of information about the main postal, telecommunications and remittance services and also subsidiary services.

# Readers' hints

**This is the feature where readers exchange worth-while ideas on workshop practice**




*Above and below: The dial-test indicator, with the parts and application of the double-joint holder*



## COMPOUND TABLE

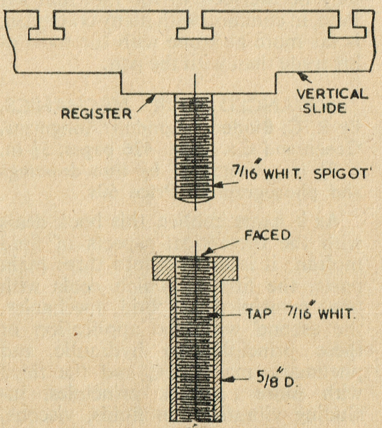
ALTHOUGH my notes are based on the Champion No 1 sensitive drill press and the Myford swivel vertical slide, they can be modified for use with other makes of equipment.

If the Myford slide is removed from its angle bracket, a register is exposed from which projects a $\frac{7}{16}$ in. Whit. screw. The device consists merely of a collar to fit this screw and turned down so that it may be held in the table clamp of the drill press as follows:

Part off and face a 2 in. length of 1 in. dia. round stock and turn down to $\frac{5}{8}$ in. dia. for a length of $1\frac{3}{4}$ in., thus leaving a squared shoulder. Without removing from the chuck, drill through letter U and tap $\frac{7}{16}$ in. Whit. from the tail-stock.

This collar will now screw on to the spigot of the vertical slide and should seat against the face of its register. The table may now be removed from the drill press and the slide assembly mounted in its place.

The slide T-slots may be used to mount a machine vice or for clamping work direct and enable accurately spaced holes, light milling and other work to be carried out from the graduated feed screw with a considerable saving in time for marking out and setting up.—L. N. B. JACKSON.




*Modifications to vertical slide for use on the drill press*

## DIAL-TEST HOLDER

HERE are details of a universal dial-test indicator holder which I now find indispensable.

In principle, it is double jointed, the two balls being retained by small opposed keep-plates, hollowed at the ends for the location of the balls. (See sketch and picture.)

Two $\frac{3}{8}$ in. dia. ball-bearings were softened, drilled through and countersunk, and were finally sweated to the legs and smoothed over. Being universal in application, the holder is extremely useful in all positions.

Tension of the movement may be adjusted by the central screw between the keep-plates.—R. JOHNSTON.

**Contributions to this feature are invited from readers. Each tip published wins a 10s. 6d. Percival Marshall book token**

## TAPERED THREADS

IT is often useful to taper the thread on fittings where a pressure-tight joint is required, especially if they cannot be shouldered or the seating is poor.

Very high precision is not required in these circumstances, and the tapered thread can be cut quite easily by making use of the feed screw slack, or backlash, present in every lathe.

First turn the material to the diameter and taper required.

Threading is carried out normally, except that the tool is eased outwards *by its own pressure on the work* instead of being held firmly at a set depth as in ordinary cutting. The cross slide feed screw is gently turned outwards while cutting, enough to keep all its slack taken up; start this before the tool begins its cut.

The gib of the slide must not be too tight. It should be possible to move the slide by moderate hand pressure within the limits of backlash of the feed screw, but, of course, it must not be loose. The threading tool climbs the taper automatically as it pushes the slide outwards against gib friction only. The cross slide feed-screw wheel feels "alive," and by gentle, continuous pressure on it the depth of cut can be kept to a few thou if necessary.

Very low cutting speeds are not recommended. Use the top slide instead—set to 90 deg.—on a big lathe. On light lathes of average home workshop size any loosening of the top slide gib might lead to disaster,

and adjustments even to the cross slide must be done with great care. —B. G. GYLES.

## FILING SQUARE HOLES

THIS process is, normally, difficult for the amateur, but the following method makes an excellent job.

Suppose, for example, a $\frac{1}{4}$ in. square hole is required in a boring bar, toolholder or a key.

First, drill the hole 7/32 in. dia., and file with a $\frac{3}{16}$ in. square or the point of a $\frac{1}{4}$ in. square file until it is nearly $\frac{1}{4}$ in. square, observing from each side of the hole for trueness. Remove the file handle and cut the sharp end off the tang, Fig. 1. Place the work in the vice and drive the file (not too hard) into the hole with a hammer, noting that it is square, or at the angle required, with the work. If it is not, do not attempt to pull the file over and hit it with the hammer otherwise the file may be broken; remove the work from the vice and file the hole a little on the side required, Figs 2 and 3.

Repeat the process by driving in and out from both sides of the work until the file goes right through, using the file as a broach.

The hole will not be dead sharp at the corners, but all that is necessary is to file or grind the sharp edges of the tool or other member that is to fit into the hole.

It should be noted that the tang of a file is not very hard and will stand steel-hammer blows, but the point is dead hard and, for driving out, a copper hammer or a copper-faced type should be used.

I find it quicker to open the jaws of the vice $\frac{1}{16}$ in. more than the size of the file and place the work on top so that it can be turned over to drive the file in and out without opening and closing the jaws.—J. E. FOSTER.

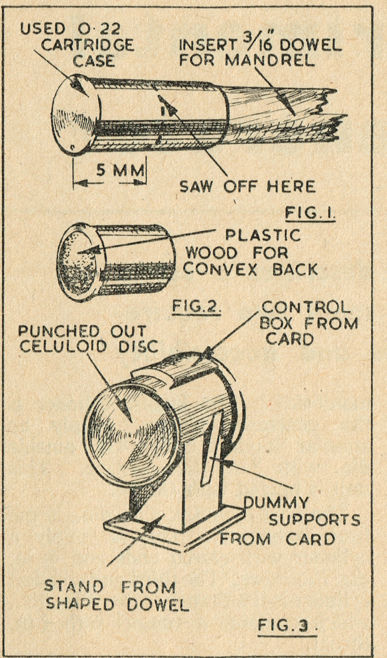
## A 36 in. SEARCHLIGHT

I AM at present completing a 16 ft to 1 in. model of HMS *Hood*, a much larger scale than I usually work to, and not having a lathe I was stuck for a method of making the searchlights, other than solid from dowel.

I discovered that a used 0.22 cartridge case was just the right diameter and my method of utilising it is shown in my sketches.

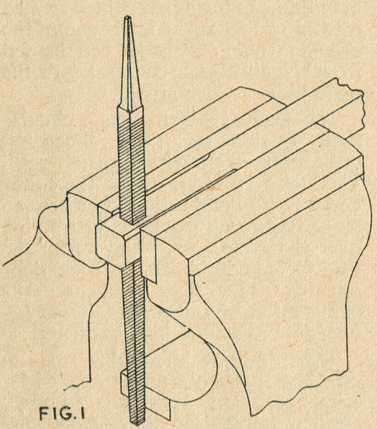
First, cut to the right length—5 mm. To do this without crushing the thin brass and producing a ragged edge, insert a piece of $\frac{3}{16}$ in. dowel and cut this at the same time, Fig. 1. To achieve the correct convex shape at the back, mould on a small piece of plastic wood. This, incidentally, covers up the cartridge maker's name and the hammer mark, Fig. 2.

A piece of dowel is shaped to take the body of the light, dummy supports and control box glued on from card, and the whole painted. The glass can be punched out from celluloid by means of an office paper filing punch, which also happens to be the right size, and glued in place after the paint has dried.—JOSEPH A. YOUNG.




*Method of making the 36 in. searchlight*

*Below, Fig. 1: The end of a square boring bar gripped in the vice with the file inserted*



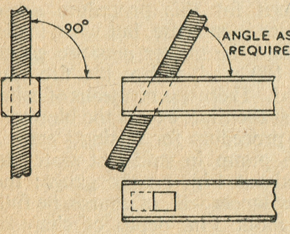




FIG.2

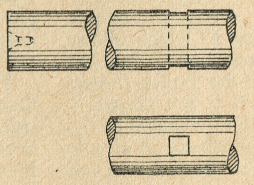


FIG.3

*Left, Figs 2 and 3: The end of a square boring bar for a tool at an angle, and a round between-centre boring bar*

## FOIL FOR FLAGS

NEARING the completion of a Stuart Royal Yacht, the question of flags arose.

Experiment proved that however thin silk or linen was used, paint stiffened the flag up and the finished result was most unreal. Ordinary foil, such as used for packing cigarettes was then tried—and this proved completely successful. Enamel paint, model aircraft dope and poster colour was used—the latter providing a little photographic wetting solution was added to the paint, enabling it to spread evenly.

The canvas headings were made from washed-out tracing linen stuck on with Durofix. The finished result has a silky sheen about it and, in addition, it can be bent and creased in a natural manner. The fact that the metal foil is opaque enables the flag to be painted without the colour from one side affecting the other.—H. W. SHOULDER.

## SHIP MODELLING HINTS WINNERS

*Winners of the ship modelling hints competition run when Ships and Ship Models was incorporated into "Model Engineer" were:*

*Mr H. Harvey, 26 Windsor Avenue, Newbridge, Mon.*

*Mr D. A. Brogden, 211 Cedar Road, Nuneaton, Warwicks.*

*Mr K. A. Johnston, 4 Liena Road, Lindisfarne, Hobart, Tasmania, Australia.*

*They have each been sent three guinea Percival Marshall book vouchers.*

# An experimental steam generator

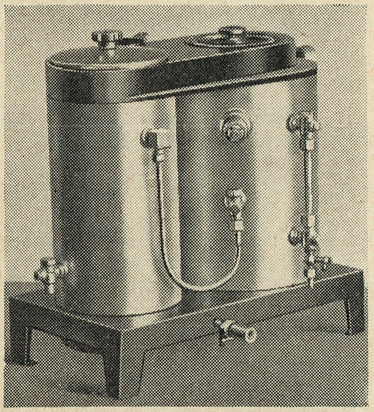
**_L. F. WILKINSON describes a steam plant designed to meet two requirements—compactness and accessibility_**

THIS generator was designed and built with the object of supplying steam to a Stuart Double Ten in a $3\frac{1}{2}$ in. gauge geared locomotive (similar to the Sentinel), or alternatively for use in a prototype boat. Also it was intended as a source of easily managed steam power for bench-testing locomotive chassis, or other steam engines.

The first two requirements placed a premium on compactness and accessibility from the top of the generator. When the generator underwent its first steam trials it was found that a most welcome but unexpected feature was the possibility of raising steam without recourse to the air starter—the use of the latter does, of course, speed up steam raising, but it is not an essential fitment.

## DESCRIPTION OF GENERATOR

An inspection of the photographs shows three vertical cylinders mounted on a shallow base and coupled at the top by a longitudinal duct (transfer manifold). The largest cylinder is the generator proper, simply an annular stayless boiler 4 in. outside dia. with 3 in. dia. furnace. This unit is brazed with JM B6.



*First and second check valves, safety valve, water-gauge and connecting pipe between heat exchanger and second check valve are seen here*

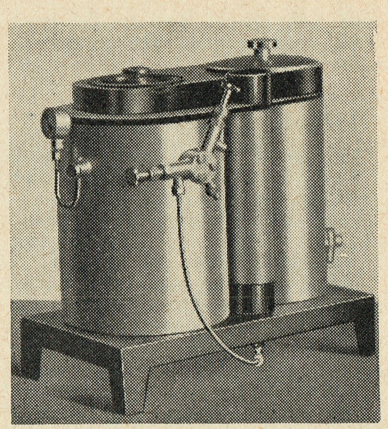
The next cylinder, 3 in. dia., is the heat exchanger. This is simply a cylinder with closed ends and $\frac{5}{16}$ in. dia. fire tubes. The third and smallest cylinder is the draught tube, $\frac{7}{8}$ in. dia., which contains a venturi with $\frac{5}{8}$ in. throat.

The longitudinal duct joining the upper ends of the two larger cylinders is called the transfer manifold, since it transfers the hot gases from the combustion chamber to the heat exchanger. The lower end of the heat exchanger is coupled to the draught tube by a duct called the draught manifold. Inducing draught is created by a No 70 jet at the lower end of the draught tube. This jet can be fed from the air starter connection or the main blower valve at will.

The steam generator has a circular grate resting on three brazed-on projections from the furnace wall. The grate is $1\frac{1}{4}$ in. above the lower end of the combustion chamber, so as to ensure an even air distribution over the grate area. The top of the transfer manifold has a firing door opening (2 in. clear dia.) over the combustion chamber and a smoke-box door over the heat exchanger.

The draught manifold has an opening directly under the heat exchanger. This opening is closed by another smoke-box door (*Juliet* casting); these two smoke-box doors are held on their seatings by a long bolt passing down the centre fire tube. The lower nut, into which this bolt screws, has an extension handle (visible in photograph) which allows the doors to be removed and replaced without upending the boiler (necessary in a boat). It is not necessary to have access to the underside of the generator for any purpose. A simple flat tray serves as an ashpan, and can be withdrawn endways.

Boiler fittings are: safety valve



*This view shows the steam gauge, main stop valve, blower valve, auxiliary steam outlet and draft tube*

(80 p.s.i.); water gauge, steam gauge, two check valves, three steam outlets, two with a stop cock for main steam and blower; the third is for auxiliary use.

## WATER CIRCUIT

Cold water enters the lowest part of the heat exchanger and leaves through an elbow fitting at the highest point. The hot gases travel through the fire tubes in the reverse direction, thus there is a contra-flow circulation.

Water from the top of the heat exchanger enters the steam generator via a second check valve about half-way up the barrel. Steam is not, therefore, allowed to generate in the exchanger, but the water at the top of the exchanger is at boiler pressure and at a temperature corresponding to that pressure. (This does not follow automatically; it depends on the proportions of the heat exchanger relevant to other parts of boiler).

As it is not possible to knock down the pressure by pumping in cold water with an ordinary tender pump ($\frac{1}{2}$ in. bore), some ready means of dropping the grate must, therefore, be on hand in case of a sticking safety valve.

A piece of 3/32 in. steel rod with $\frac{1}{4}$ in. bent over can be pushed between the firebars and the grate tipped up. The need for this procedure arose only once in my case, but when it did I watched the master pressure gauge go to 180 p.s.i. before the fire was dropped. There was no means of using steam at the time, except the blower.

The procedure for raising steam is first to pump in sufficient water to show about 1 in. on the gauge: the heat exchanger will, of course, be full. Place about 1 in. depth of charcoal nuts saturated in meth. on the firebars and drop in a lighted match. There

should be no excess of meth. because if it falls into the ash pan and starts to blaze the air supply to the furnace will be cut off.

The fire door must be left open till sufficient steam is raised to operate the blower; this will be as soon as the pressure-gauge is off the pin. Shut the fire door and slightly open the blower. Feed anthracite as soon as the fire bed is red hot over all.

### IMPROVEMENTS TO PROTOTYPE

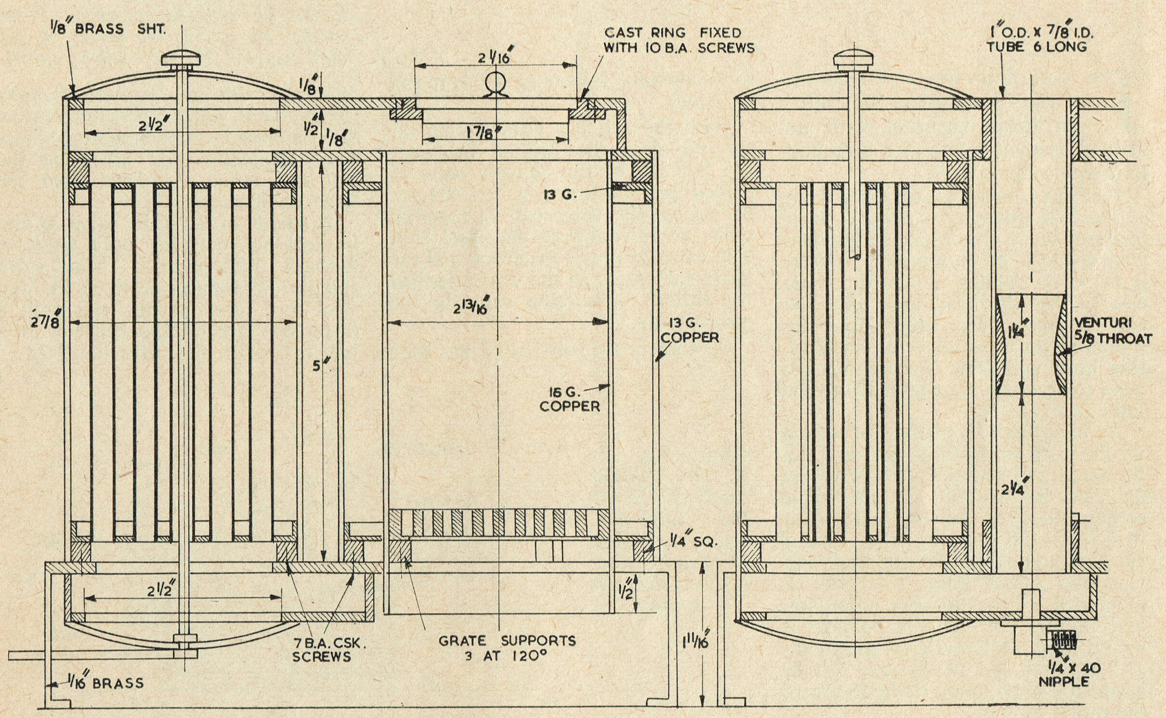
The size of the heat exchanger can be much larger; up to at least the size giving a total tube cross-sectional area equal to the cross-sectional area of the combustion chamber, this ensuring constant gas velocity in the effective parts of the system.

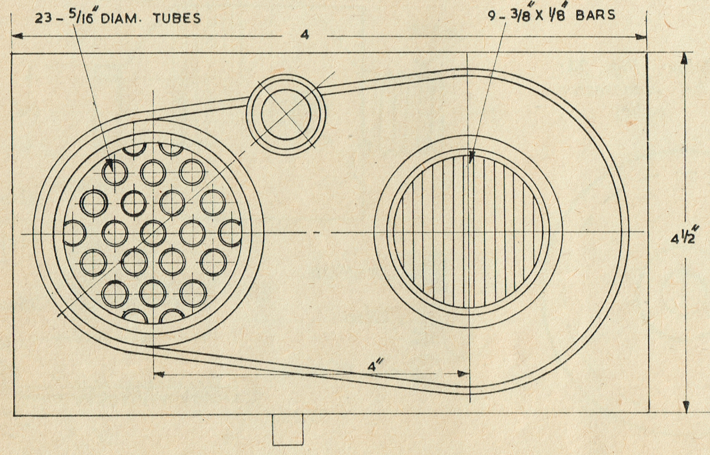
The whole assembly could be heat insulated. In model sizes thermal efficiency has to be subordinated to consideration of space and operating convenience.

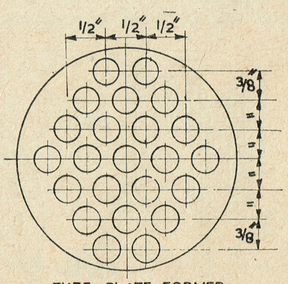
More practical alterations for the locomotive edition of this generator would be the installation of blow-down valves on each section and a superheater consisting of $\frac{3}{16}$ in. copper tubing coiled in a spiral round the upper half of the combustion chamber. The disposition of boiler fittings could be arranged to suit the locomotive.

An annular blast-pipe cap surrounding the blower jet can also be incorporated in the locomotive version. Both blast cap and blower jet can be changed by simply sliding up the draught tube, which is a sliding fit in its top and bottom tube guides. The venturi can also be dispensed with—since the draught tube is 6 in. long.

Finally this type of boiler requires some form of reliable pump feed, other than a hand pump. ■



TUBE PLATE FORMER 2 13/16" x 1/4"

# A cutting-oil feed for the lathe

## By DUPLEX

### THE AIR COMPRESSOR

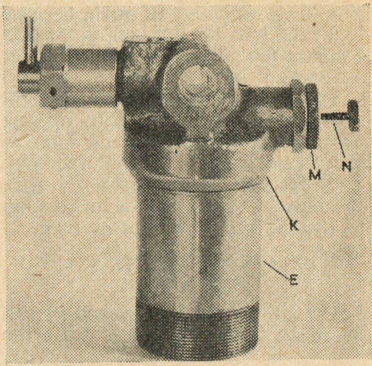



*Fig. 20: The cylinder assembly.* E *the cylinder barrel;* K *the head;* M *the relief valve;* N *the valve spindle*

To complete the construction of the compressor the cylinder head, together with its fittings, is next made and attached to the cylinder barrel.

The head is perhaps best made from a brass or gunmetal casting, but if preferred it can quite well be machined from a block of duralumin. A start is made by drilling a $\frac{3}{8}$ in. dia. hole right across the head and, after the end surfaces have been faced by mounting the work on a stub-mandrel, this bore will serve for bolting the head to an angle plate attached to the lathe face plate.

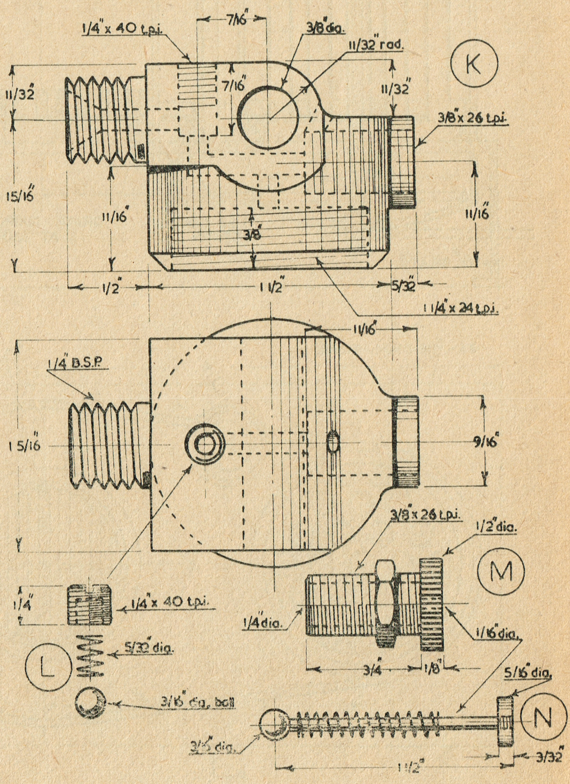
By adopting this method of setting up the work in the lathe the head can be bored and screwcut to receive the cylinder barrel and, at the same setting, the air delivery passage is drilled. On turning the casting through an angle of 90 deg. and centring the outlet boss, this part is machined for a $\frac{1}{4}$ in. gas union nut and nipple, and the air passage is also drilled. Alternatively, the standard brass thread of 26 t.p.i. can be adopted for the union fixing to secure the outlet nipple.

The lug to receive the relief valve is centred after the casting has been turned through 180 deg. for drilling the valve housing 21/64 in. and afterwards tapping it $\frac{3}{8}$ in. $\times$ 26 t.p.i.; at the same setting the air passage shown in the drawing is also drilled from the tail-stock.

With the cylinder head resting on the table of the drilling machine, the housing of the delivery valve is drilled and tapped $\frac{1}{4}$ in. $\times$ 40 t.p.i. to receive the valve cap *L*, together with the valve spring and steel ball. The valve seating is machined and the ball itself seated in the way described for fitting the suction valve in the piston body.

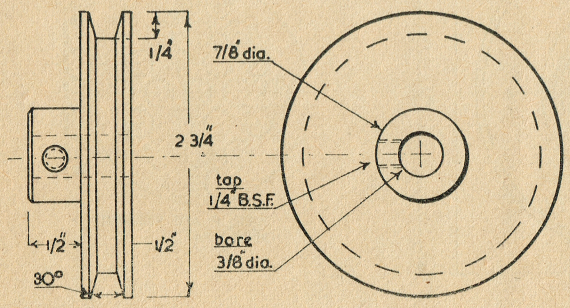
As shown, the valve cap *L* has been dispensed with and its place taken by the spindle *P*, which serves for rotating the compressor on its mounting spigot when tightening and loosening the belt to operate the drive from the lathe countershaft.

The body of the relief valve *M* and its lock-nut call for only straightforward machining. The valve spindle *N* is made from $\frac{1}{16}$ in. dia. steel rod, fitted at one end with a finger-grip and at the other with a ball to seat in the valve housing.




*Right, Fig. 21:* K *the cylinder head;* L *the delivery valve ball, spring and cap;* M *the relief valve body;* N *the valve spindle*

*Below, Fig. 24: The compressor pulley*



The body is made adjustable so that the spring tension can be set to vary the output pressure of the air to suit the working conditions. The ball is best secured by shouldering the valve spindle and riveting over its end after the ball has been cross-drilled and fitted in place.

A phosphor-bronze ball can be readily drilled by gripping it in the self-centring chuck and carrying out the preliminary drilling with a small centre drill held in the tail-stock chuck. If a ball of this kind is not available, an ordinary steel cycle

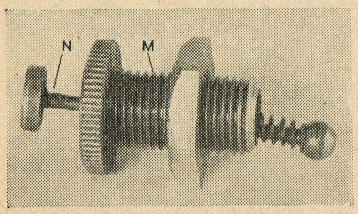



*Fig.* 22: *The relief valve*

ball can be easily dealt with in the same way if it is first softened by heating until it becomes deeply blued.

Provided that the run of the air passages has been checked and found correct, the machining of the cylinder head is now complete and the barrel can be screwed home and secured in place by sweating if the two parts are made of brass; but if duralumin has been used for either part, the threads should be smeared with jointing compound before the parts are finally assembled and secured with a grub-screw.

## THE DRIVE

The relative diameters of the drive pulleys are adjusted to enable the compressor to run at some 400 r.p.m. when driven by a round or V-belt from the lathe countershaft. The driven pulley is purposely of heavy construction to serve as a flywheel for promoting smooth running of the compressor.

As shown (Fig. 23), the compressor is mounted on the spindle *Q*, which in the present instance is bolted to one of the uprights of the lathe overhead. This spindle passes through the $\frac{3}{8}$ in. dia. hole drilled across the cylinder head and so enables the compressor to be rotated by the lever *P* and afterwards locked in position by tightening the small finger lever.

Rotating the compressor in this way slackens or tightens the driving belt which then serves for clutching the compressor in or out of operation while work is being machined in the lathe.

To ensure that the belt when slackened rides free on the countershaft pulley, the belt fork (Fig. 26) is mounted on the bench top and the upper and lower runs of the belt then pass between the two tines. This forms a very simple and satisfactory form of transmission clutch for either round or V-belts and, for my part, it has been giving good service for some time, after being installed in the V-belt drive of a vertical milling machine and powered by a 1/3 h.p. motor. In the present instance the compressor can be controlled by manipulating the two levers with the finger and thumb of one hand.

## LUBRICATION

Before the compressor is put to work, thin oil is added to the crankcase so that it can be carried to the working parts by the rotating crank disc and the big-end of the connecting rod. By removing the oil plug on the side of the crankcase, oil can be added until its level reaches the crank disc.

Although oil from the crankcase should reach the crankshaft bearings, lubrication can be maintained with

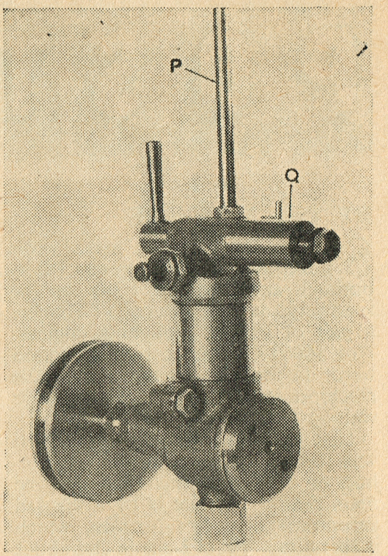



*Fig.* 23: P *the belt-tensioning lever*; Q *the compressor mounting spindle*

certainty by drilling an oilway in the crankshaft bearing-spigot, midway between the bushes, and giving an occasional squirt of oil.

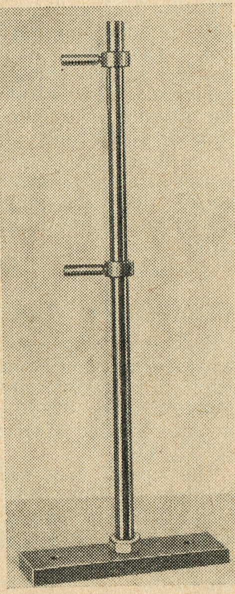
## OPERATING THE SPRAYING ATTACHMENT

After the compressor has been mounted in place and the drive arranged, the spray gun is connected up with a length of plastic tubing to allow free movement of the lathe saddle, and the container is part-filled with cutting oil. When the lathe is running, the compressor is started by swinging it on its mounting to tighten the driving belt. The oil spray will then be delivered almost immediately; but if there is any delay, it is only necessary to press the button of the relief valve to raise the output pressure of the air, and the gun will at once begin to act.

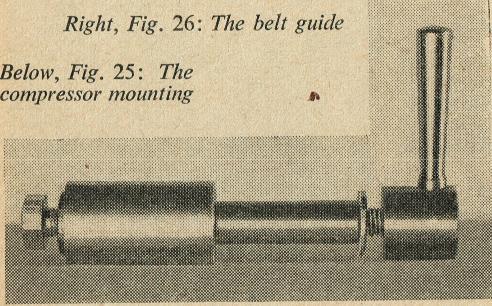
The tension of the relief valve spring is set so that only a very small amount of oil is sprayed and, since the fine oil mist formed is almost invisible, the delivery should be checked by holding the finger nail close to the spray nozzle. On no account should the surrounding air be filled with oil mist, for this might be inhaled to the possible detriment of the operator.

A surprisingly small amount of thin cutting oil will be found effective in promoting free machining and enhancing the finish left by the tool on the work. When machining aluminium and its alloys it may sometimes be found an advantage to dilute the cutting oil with an equal quantity of paraffin. ■

*Right, Fig.* 26: *The belt guide*



*Below, Fig.* 25: *The compressor mounting*



# POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

## BY THE WAYSIDE

SIR,—A few weeks ago, while travelling on A15 between Peterborough and Sleaford, I saw on the road verge at the north end of Thurlby a pair of Fowler ploughing engines, Nos 16063-4. The cab and motion were tarpaulin covered, and the machines looked as though they were waiting for the next job.

Last year an interesting graveyard was passed, once again while travelling on A15, but this time not the main road. The site is by a disused aerodrome near Spridlington, which is six miles north of Lincoln and about two miles east of A15. Here lay, in varying stages of decay, Fowlers 15416-15417 ploughing engines; W. Foster 2775; Clayton-Shuttleworth 43200; J. and H. McClaren 682; and two more Fowlers on which I could not find a serial number.

I should be pleased if anyone could help on two points: (*a*) catalogue material on the Seneca Falls Star Lathe; (*b*) about 30 years ago there was some lively correspondence in ME on compound v. simple engines, and a leading advocate of the compound, Charles R. King, issued a brochure *Tables of MEP, Horse Powers and Tractive Efforts.* While looking through some old papers I came across a copy, but found that page seven was missing.

If any reader could loan either or both of the above items, to allow for photograph copying, I would be grateful.

Birmingham 16. S. POTTS.

## ALL IN FUN

SIR,—I, too, read Mr Tucker's letter and was amazed that Mr Mace [Postbag, May 9] had taken objection to it. Unfortunately, we always have people who either cannot see intended fun or seem to lack a sense of humour. I can assure Mr Mace that Mr Tucker was merely poking a little good natured fun at the shipbuilder, nothing more.

I feel certain that all readers of MODEL ENGINEER, including Mr Tucker, welcome the shipbuilders back into the fold, as it were, and ME is all the richer for the added interest.

Johannesburg. D. F. HOLLAND.

SIR,—For Mr Mace to take umbrage, instead of viewing with amused contempt, the efforts at taking the mickey out of the dead language in which his avocation is written appears to show very little sense of humour.

Being an engineering designer by profession, and possibly possessing no aesthetic taste for art, to me, non-functional embellishments, excluding tidy coverings are an anathema.

I find square riggers and clippers, with their masses of telegraph poles, blankets and clothes lines looking like washday hit by a hurricane, are extremely untidy. The most beautiful sailing vessel, to my mind, is a racing yacht because it carries the minimum of rigging.

I am building a traction engine, not because I have any liking for steam or because it is a joy to behold, but because it is a good exercise in mechanical bench practice.

Can it be a psychological subconscious protest against the rate of change in this modern world that causes people to see beauty in obsolete and inefficient mechanisms?

London, E.6. A. E. CLAUSON.

## MACHINING MANDRELS

SIR,—Martin Cleeve's method of machining small mandrels [ME, June 6] can be simplified and a high degree of accuracy assured by the following procedure.

Centre both ends of the stock and turn to approximately 1/64 in. oversize. Grip the small end of the mandrel in the chuck and support the large end in a fixed steady. Drill the mandrel through halfway and bore for Morse taper. Into this taper put a Morse centre, the 60 deg. point to run in a female centre in the tailstock. Run the mandrel between centres and finish to detailed specification.

King's Lynn. JOHN D. ELAM.

## KEGWORTH CARNIVAL

SIR,—Reading a recent Club News item I noticed that Clubman quoted the date of Kegworth and Chester-le-Street rallies as July 27. Kegworth is on July 27, but Chester-le-Street is on July 13.

The models' tent will again be a highlight at Kegworth. Those who would like to display models should contact Mr J. Jones, of Borrowell, near Derby.

Kegworth. NORMAN J. BROWN.

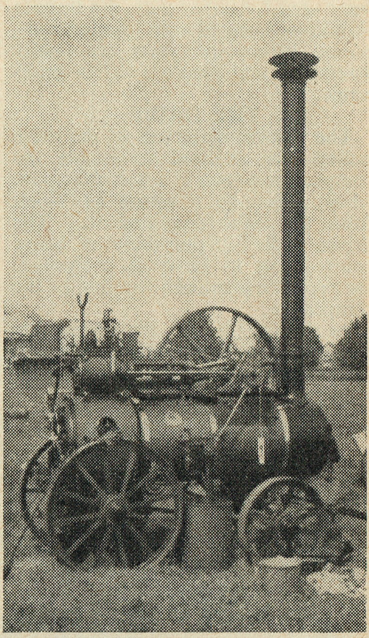
## PRESERVING ENGINES

SIR,—The letter by J. Thompson referring to winding engines [Postbag, May 9] prompts me to write regarding the necessity of making some endeavour to preserve a few examples of these unique old engines before they are lost to the scrappers.

It would be pleasant to know if any engines have or will be preserved. Could not the outstanding example of the Cornish Engines Preservation Society be followed by a similar society—in the north of England, or elsewhere?

The CEPS has achieved the preservation of five Cornish pumping and winding engines, four of them on their original sites, and one built into the museum at the experimental department of Holman Bros, of Camborne, whose magnificent co-operation with the society has made the scheme possible.

These engines will be maintained under an annuity system for all time. Surely this example can be followed in other parts of the country, naturally



*This lofty-funnelled traction engine will be on show again at this year's Kegworth Carnival*

the support and co-operation of the engines' owners is a necessity; this has been wholehearted in Cornwall. Regarding colliery engines, the attitude of the Coal Board would be a consideration.

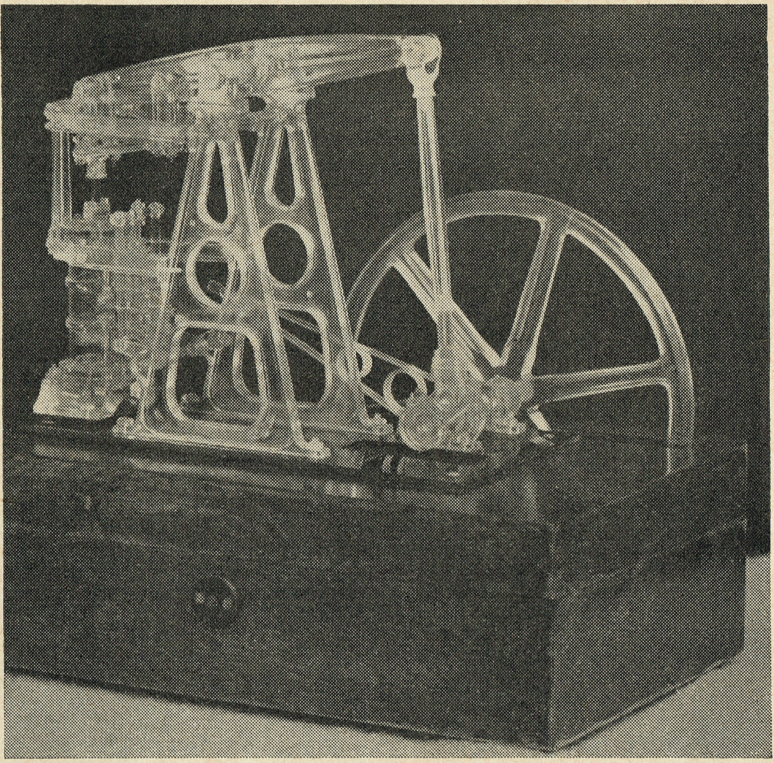
Would Mr Thompson be prepared to give us a fuller description of the vertical type of engine with "cross gear" control, with which many of us, I am sure, are not conversant ?

Plympton, South Devon. J. F. WELLINGTON.

## ENGINE IN PERSPEX

SIR,—I enclose a photograph of a Vulcan beam engine which I have made in Perspex. It might shock Mr Westbury, who might frown on such an anachronism, but then he shouldn't write such interesting articles on plastics.

Salisbury. W. GUY FISON.



*Vulcan beam engine constructed in Perspex*

## LITTLE BIG 'UN

SIR,—I read with interest the letter from M. E. Moon [Postbag, June 6]. Mr Moon is an old friend of mine, and I have known *Susie M* for many years. I have never ceased to be amazed at the performance of this little engine, which seems to reproduce the hauling qualities of its big sisters in an uncanny fashion.

Mr Moon has made a 5 in. gauge dynamometer car, and I well remember an occasion on which comparative haulage tests were made between a good three-cylinder Pacific type 3½ in. gauge locomotive and *Susie M*. Although the little tank engine had but a fraction of the weight of the Pacific, her tractive effort exceeded that of the larger engine by several pounds, both from a standing start and on the run.

Anybody who wants to build a compact engine for heavy hauling duties would find this simple type of contractor's engine to have a performance at least equal to if not better than that of the more ambitious types.

Crowborough, Sussex. H. E. WHITE.

## SPIRAL GEARS

SIR,—Those spiral gears as referred to by Mr Curwen and others for the Seal engine seem to be rather a headache.

Two identical gears are required, o.d. 0.330 in., with seven teeth, whole depth 0.060 in. A standard spur gear cutter No 6, 36 d.p. may be used, angular setting of milling spindle 45 deg.

To obtain the required spiral angle on lathes with 8 t.p.i. leadscrew use the following change wheels: the mandrel 70 wheel (for indexing), first stud 38-75 leadscrew 20; second choice 70 20-40 20; third choice 35 30-60 20-40 20.

Inspector Meticulous can have fun with the latter two, but only make mild comment on the first.

Right-hand spiral gears are used for the "standard" engine. Feed with the leadscrew handwheel, and have a "dummy run" on a piece of scrap rod.

Shaft centre distance will be 0.275 in.

Assam, India. K. C. CORPS.

## INVITATION

SIR,—I have at my home in north Hertfordshire, a 5 in. gauge outdoor track about a tenth of a mile long, and I would welcome a visit from any of your readers who would like to try out their locomotives. Any interested party should approach me through MODEL ENGINEER.

LESLIE E. H. COOK.

## THE FINEST ?

SIR,—No doubt many readers will be coming to Cornwall on holidays this summer, and what a fine chance they will have to view one of the finest showman's engines in the country—*Challenger*.

*Challenger* is an 8 h.p. double-crank, two-speed, Burrell, mounted on 7 ft × 20 in. rear wheels. It has single drive, geared pump, two injectors and flywheel and wheel rim brakes. It stands 14 ft from ground to chimney top. The maker's number is 2651 and it was built in 1904.

Within the last few months *Challenger* came through a boiler survey with flying colours, and is still on her original pressure of 200 p.s.i. Her proud owner, W. H. Jones of St Issey, Wadebridge, Cornwall, has recently fitted a larger dynamo and a flywheel brake, which can either be operated by foot or hand.

This mammoth traction engine will, I understand, be travelling under her own steam to attend the steam traction engine rally at Camborne on July 20.

J. M. C. WINN.

## NEW ZEALAND

SIR,—Regarding registration of prime movers mentioned in Mr Webber's letter [April 18], I have never heard of this. In any case high power motors are not likely to be of much interest to the model engineer.

Tools are expensive in New Zealand and Mr Webber's advice is good: "Bring the lot." If our friend has a bicycle he should bring that too. If it has been in his possession for

## POSTBAG . . .

12 months it is allowed in duty free. Bikes are an outrageous price here.

I shall be pleased to help further if your enquirer cares to write to me direct.

Seabury Avenue, Foxton Beach, North Island, New Zealand. ALEX RADFORD.

### BRAZING TOOL

SIR,—Having made a very efficient brazing and soldering tool I pass the details on to you for the benefit of fellow readers.

First, I obtained a piece of $\frac{3}{8}$ in. bore steel tube 9 in. long (aluminium is also suitable) and an old file handle drilled through the centre. A slight set was made 3 in. from the end of the tube, and the file handle was then pushed on until $\frac{1}{2}$ in. protruded from the other end. I fitted my gas tube to this, and for a jet I used the female end of a bicycle connector which was an admirable fit.

It did not cost more than 4s., and it is a most useful item.

Welling, Kent. H. LEE.

### BUILT TO ME PLANS

SIR,—I enclose a photograph of a double Vulcan beam engine I have constructed from the ME drawing.

You will note that some licence has been taken with the flywheel, motion links and big-end bearing. In the latter you will see I have supplemented the gib and cotter with two bolts through the bearing strap, which, while not being strictly true to type, makes a very secure job at this important point.

The bronze and iron castings were supplied by W. H. Haselgrove, and I can commend them both for allowance of material and machining quality. A good deal of stainless steel has been worked into the rest of the model, which has given much pleasure and interest to build.

Yorkshire. J. DON.

### BOAT BUILDING PINS

SIR,—With regard to the difficulty of obtaining fine entomological pins for model boat building, I would like to mention that I have at last managed to obtain these useful pins in many sizes at quite reasonable prices from Janson and Sons, of 44 Great Russell Street, London, WC1.

Finchley, N2. D. ATKINS.

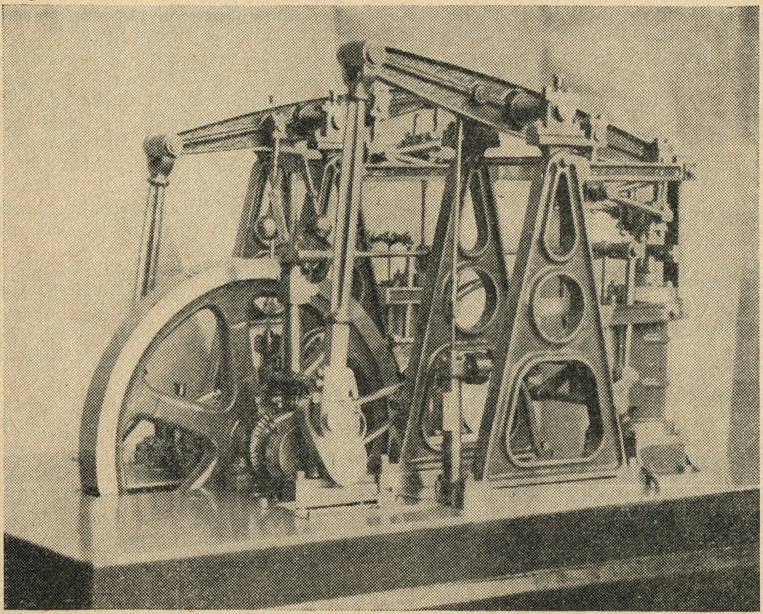
### HEAT SOURCE

SIR,—The Meker type burner referred to in your reply [Readers' Queries, May 23] should be available with a special incorporated air injector base (surrounding the gas nipple) and terminating in a feed tube exactly similar to, and above, the gas tube: both adapted for ordinary flexible tube connections.

I have one of these burners and it is capable of producing an intense heat.

I obtained the burner some years ago from Brayshaw Tools and Furnaces Ltd, of Manchester. The actual maker was G. Meker, Courbevoie, France.

Birmingham. W. WARE.



*Vulcan beam engine built to plans in* MODEL ENGINEER

## *A miniature air compressor plant*

*Continued from page 5*

live in the event of switch breakdown.

The switch base is $\frac{1}{4}$ in. Perspex. It may be necessary to recess this slightly to allow for diameter of bellows. Alternatively, the micro switch and other fixtures can be raised up by packing, bringing the whole mechanism further away from its base.

The thrust plate *I*, Fig. 4, is $1\frac{3}{8}$ in. × $\frac{3}{4}$ in. × $\frac{1}{8}$ in. and it is brazed to a $\frac{5}{8}$ in. mounting block. It should be drilled clearance size for part *A* which is held in place by pressure of spring *F*.

The operating rod *J* is $\frac{1}{8}$ in., threaded 40 t.p.i. each end. Bearing *K* is of $\frac{1}{2}$ in. square section brazed on to a $\frac{1}{8}$ in. × $\frac{7}{8}$ in. × 1 in. base. It is drilled $\frac{1}{8}$ in. clearance for the operating rod.

It is useful to be able to disconnect the flex lead entirely when moving the unit about, or for storage. Resist the obvious temptation to take internal wiring to a flush-fitting wall socket recessed through the casing. It may look neat, but the two-pronged plug necessary for connection with it, being on the end of *live* flex, will gradually kill off everyone in the house.

Internal wiring was taken to a two-pin 5 amp plug of the flat type, screwed to the base in such a way that the ends of its pins came flush with outside of casing. A $1\frac{1}{2}$ in. × $\frac{1}{2}$ in. rectangular hole was cut in the casing —just large enough to admit a flat two-hole socket, which plugs in after the same principle as the connection to most household irons.

An improvement would be to follow the principles expounded by Mr Turner, incorporating three-pin connections with an earth wire, especially if the outside of the casing is to be given a metallic paint finish. I did not do so because all the sockets on the premises are two-pin type.

The airline shown in the photograph can also be removed simply by unscrewing its union nut. Aerograph unions are coneless type, $\frac{3}{8}$ in. × 32 t.p.i. It should be noted that a heavier load than the one mentioned may cause overheating. ■

**Do not forget the query coupon on the last page of this issue**

# READERS' QUERIES

**This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W1**

## Mandrel wobble

I have just purchased a secondhand 4 in. round bed Drummond lathe, and was very disappointed to find on trying it out that there is a decided wobble at the threaded nose of the mandrel, which becomes more obvious when a centre point or face plate is fitted to it.

It appears as though the threaded portion of the mandrel nose has become slightly bent. Is it possible for me to put this right without going to the expensive expedient of buying a new mandrel spindle? I suppose it would be inadvisable to put a centre point in the mandrel and lightly hammer it to correct the bend.—FM, Totnes, Devon.

▲ *It would be extremely difficult to straighten a bent mandrel properly, though it would not be altogether impossible. You are not advised to straighten the mandrel while still in its bearings, as these might be damaged by the hammering. The best way to do it would be to support the mandrel in V-blocks on a flat surface. The mandrel surface should be protected from damage by soft copper or aluminium interposed between the shaft and V-blocks. Then, after inserting a tapered shank in the mandrel and hammering as you suggest, the truth of the internal surfaces of the socket should be tested with a dial test indicator or similar instrument.*

## Fitting valve gear

I am building the O gauge 4-6-2 coal-fired locomotive, *Sir Morris de Cowley*, to LBSC's instructions from a set of drawings. Could you tell me whether it is possible to fit a reversing gear; none is shown on the drawings. The valve motion is slip eccentric inside the frames on to cylinders and valve chest outside the frames.

Finally, could you give me the working pressure and test pressure of the boiler of this locomotive?—EWW, Edmonton, London, N9.

▲ *The valves of* SIR MORRIS DE COWLEY *are operated by slip eccentrics, which is the standard method for all O gauge steam locomotives. Although the fitting of a normal valve gear would not be impossible, it does call for outstanding workmanship—and there is the snag that the working parts cannot be made robust enough to stand up to really hard work.*

*Suitable working pressure for this locomotive would not be anything less than 60 p.s.i.*

## Gear cutters

I wish to purchase a gear cutter to cut three sizes of gears—30 t, 25 t, and 18 t Myford type. Could you give me the number of the gear cutter? In addition could you tell me the type or brand of Tufnol required?—WPJ, London, SE1.

▲ *The Myford change wheels are of 20 diametral pitch—that is to say, 20 teeth per in. dia. on the pitch circle. Properly speaking, the three sizes of wheels you propose to cut should require separate cutters, namely:*

*No 4 for 30 teeth*
*No 5 for 25 teeth*
*No 6 for 18 teeth.*

*This would be necessary to get perfectly accurate teeth form in all cases. But it is probable that you could cut all three wheels with a No 5 cutter and obtain sufficiently accurate results for practical purposes, particularly if you are prepared to lap the gears or run them in after cutting.*

*With reference to the brand of Tufnol required, a great deal will depend on what the actual duty of the gears is, but several brands of Tufnol have been used successfully for gears.*

## Fixing brass letters

I am fixing, with miniature pins, some $\frac{3}{16}$ in. embossed brass letters to a wood pattern, but I am wondering whether the pin heads and joints of the letters will show in the finished casting.

I have noticed numerous castings with letters on flat and recessed surfaces, and all appear most workmanlike. How is this attained?—ALR, Scarborough.

▲ *Unless the pinheads can be sunk absolutely flush with the surface of the letters, they will almost certainly show in the finished casting; but this may not necessarily be a disadvantage as they could be filed down flush afterwards provided that the height of the letters is not unduly affected. However, it is usual to cement letters to wood patterns, using a suitable adhesive which has an affinity for metal such as Pliobond and Aerolite glue.*

*To avoid the risk of letters becoming detached from the pattern when in constant use, the usual practice is to make up the necessary lettering on a plate and get this cast, then use it as a pattern sunk flush with the surface of the wood and pinned or cemented in position.*

## Realigning lathe centres

I have recently reclaimed my Myford ML7 lathe, which I have had to store for a number of years.

I have dismantled it completely and cleaned off all the rust preventive but I am now at a loss for a simple method of realigning the head and tail-stock. I have considered assembling all parts temporarily with a test bar between the centres and clocking with a dial gauge mounted on the cross slide, traversing along the bed and adjusting the head and tail-stock to suit. If you consider this a good method, where can I obtain a suitable test bar, about 1 in. dia. and 18 in. long, accurately centred at each end and ground parallel along its length?

The only precision measuring equipment I possess are 1 in. and 2 in. micrometers and a Boxford dial gauge, 15-0-15 thou.—PJM, Lee, London, SE12.

▲ *The method you suggest is quite satisfactory, but first the adjustment of the headstock in relation to the bed should be carried out to ensure parallel turning or boring of work held in the chuck.*

*This can be done by means of a bar held in the lathe chuck without tail-stock support and with the test indicator on the cross slide or in the tool post. A check is made at various positions along the length of the bar. It should, of course, be checked dead truly before hand, but if this is not practicable a test may be made by taking a cut on a fairly stiff bar and checking parallelism with the micrometer.*

*Having adjusted the headstock by this method—incidentally, the Myford ML7 lathe has adjusting screws at the front of the bed for alignment—the test between centres can be carried out by the method you suggest, but only the tail-stock should be moved to correct errors. On no account should the headstock be moved after adjustment.*

*A parallel test bar suitable for testing between centres can be obtained from the Myford Engineering Company, Neville Works, Beeston, Notts.*

# A ship modeller's diary

## By JASON

UNDER the auspices of the Thames Shiplovers and Ship Model Society we celebrate, on Sunday, the seventh annual rally of sailing ship models at the Round Pond, Kensington Gardens.

A flask, a packet of sandwiches and a few score entries should give us, blessed with fine weather, a really enjoyable day.

There are four classes of models in the competition: 1 windjammers and all square-rigged craft; 2 fore-and-aft rigged craft excepting those mentioned in class 1; 3 native and experimental rigs of all kinds; 4 Thames barges to ½ in. scale.

The Thames barges will sail off a match for the Thames Barge Sailing Club Challenge Trophy. The conditions of this match get a little stricter each year, yet entries have been received from as far away as the West Country. Next year it is hoped to hold the first sailing match for the square-rigged class.

If you would like to have a go report—with model—to one of the stewards at the meeting. (Mrs Peggy Lavis has kindly consented to preside.) Secretary is John H. Fisher, 19 The Grove, Greenford, Middlesex, from whom you may obtain the latest news of the summer programme.

### Mayflower II

NO one will dispute the success of the *Mayflower II* project. It was overwhelming, and Thames Shiplovers may well be proud of that fact that two of its members were master and bosun—Commander Villiers, DSC, and Ike Marsh, twice winner of championship cups for sail at Model Engineer Exhibitions.

Although, in the circumstances, *Mayflower II* made good time, she was not designed for record-breaking passages, and her master made the proper choice by taking the "south-about passage" along the trade winds.

### Mid-19th century small craft

ARISING from my recent correspondence anent *Cutty Sark* and her windlass, I received information on a book unknown to me from Mr J. Clements of Gravesend, Kent. The volume is entitled *All About Ships and the Way to Make Models of Them by Captain Charles Chapman* (1869).

Now that is nearly a hundred years ago. In discussing the contents Mr Clements mentions *inter alia* "the book contains much interesting information, particularly about coasters and small vessels." I know of many modellers who are interested in small craft . . . the local librarian, if he has not got this book on his shelves, would be able to obtain it from one of the central libraries.

Incidentally *The Caliph*, a well-known clipper which disappeared on her maiden voyage, is sufficiently dealt with for the average modeller.

### Detailed plans for ship modellers

BY the next post I had some plans and lists from my old friend Harold Underhill in Glasgow. The plans dealt with two ships, the auxiliary four-masted barquentine *Almirante Saldanha*, built in this country in 1933 for the Brazilian Navy as a training ship, and the four-masted barque *L'Avenir* built in 1908 as a Belgium cadet ship. She was posted missing 31 years later while in the service of the Hamburg-American Line.

The former vessel is almost naval for she mounts 4 in. guns in addition to lighter anti-aircraft guns and torpedo tubes. Her profile is somewhat misleading. What appears to be a flush deck is really a well deck surrounded on either side by gangways along the side of the ship in the manner of eighteenth century frigates.

She is a most unusual vessel, giving unlimited scope to the modeller in any material; the plans even include a belaying-pin diagram. She does not represent packet, clipper, or windjammer but rather a well-planned naval cadet ship of the present century.

*L'Avenir*, on the other hand, represents the pinnacle of the windjammer development and, with the possible exception of *Cutty Sark*, offers more details to the modeller than of any other known sailing ship.

### Choice of subject

"WHAT shall I make next?" I am often asked this question and to answer it properly a knowledge of foregoing work, background and occupation is required. It may be taken for granted that the choice of subject is an index of character to a limited degree.

For example, why build a model five masted full-rigged ship as first or early attempt? Why not a brig or even a brigantine? Here are two square-rigged masts or, in the latter example, one square-rigged and one fore-and-aft rigged mast. The five-master normally has all the masts rigged alike and of the same height. It is a test of monotonous repetition.

A friend of mine turned out a five-master and won the championship cup for sail in that year. Why that choice? Well, he was a foreman shipwright and had helped to build the prototype.

Turning to steam, how often do we see one of the Queens selected as a subject? Beginners usually fall for this type. Yet a liner is a difficult job at any time by reason of the large number of identical boats, patent davits, portholes, and ventilators.

The beginner understands only vaguely the purpose of jigs. He expresses great astonishment that the making of a jig may easily take twice as long as the resulting job.

### Gratings to scale

NOT so very many years ago the making of gratings to scale was a tedious and soul-destroying job and the result was satisfying neither to maker nor onlooker.

Yet in the last dozen years, by cleverly designed jigs, enormous advances have been made. It may be said that the beginner is left far behind in this, that toolmakers hold the field. This is not so. Most toolmakers are proud of their craftsmanship and maybe the time is not far off when each ship model club will have a toolmaker or two among its members—just as today it is not so unusual to have artists as members.

The toolmaker will be happy in designing a jig to solve your problem. This is no dream. Already Draper and Jenkinson have, between them, designed and made a number of jigs and tools for various operations. One of their more recent efforts is an instrument to take off the lines of a model in a greater or lesser scale. Sufficient to say that it follows the idea of pantograph.

It is not sufficient to have the idea. It has to be made of the right metals and be practicable. This, of course, is a very ambitious jig. May it not be a blessing in disguise that we ship-modellers find ourselves in the embrace of a large body of engineers? What can we offer in return? Maybe we have something that they want. ■

Model Engineer

Classified Advertisements together with remittance should be sent to Model Engineer, 19/20, Noel Street, London, W.1, by latest Thursday morning prior to date of publication. Advertisements will be accepted from recognised sources by telephone. GERRARD 8811. Ex. 4

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## WORKSHOP EQUIPMENT

**Buck & Ryan for Lathes and Workshop Accessories,** drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone: Euston 4661.

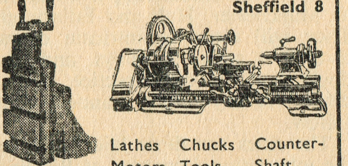
**Immediate Delivery from Stock,** Myford "ML7" and Super 7" lathes, Super Adept lathes, bench planers, shapers, electric motors, small tools.—F. W. Kubach, 12, Sylvan Road, London, S.E.19. LIV 3311-12.

**Home-Master Workshop.** All-in-one units, £14 10s. or £2 10s. deposit and 8 monthly payments of £1 15s. Will be sent carriage paid on receipt of deposit. (Money back guarantee if machine is returned within 7 days.) Write for/send orders to—The Acorn Machine Tool Co. (1936) Ltd., 610-614, Chiswick High Road, W.4. Telephone No. Chiswick 3416. Free 36-page booklet on application.

**Good Cash Prices** offered for old "Atlas" 5" lathes (or similar) or can be used against the supply of a new machine of any make with balance over hire purchase 12, 18 or 24 months. Write with details of make and condition, equipment offered and price required to—The Acorn Machine Tool Co. (1936) Ltd., 610-614, Chiswick High Road, W.4, or telephone CHIswick 3416.

**LATHE CABINETS**
Designed to suit $3\frac{1}{2}$ in. Centre Lathes.
Heavy gauge sheet steel, all welded construction, with chip tray, pedestal cupboard and door containing three shelves.
Colour finish—blue.
Nett weight—approximate 90 lb.
Price complete: £17 10s.
*Details on request*
Cabinets to suit lathes up to 6 in. centres.
Trade and overseas enquiries invited.
STANILAND BROTHERS, ENGINEERS
Brockley Road, Navigation Road, Chelmsford, Essex

**CHARLES PORTASS & SON**
Buttermere Works, Sheffield 8



Lathes Chucks Counter-Shaft
Motors Tools

**New Tool Bargains.** Sets of H.S.S. twist drills on stands, complete. $\frac{1}{16}$"-$\frac{1}{2}$" × 1/64", £3 10s. Letters A to Z, £2 15s. 1-60, £2 10s. H.S.M.T.S. twist drills $\frac{7}{16}$", $\frac{1}{2}$", $\frac{9}{16}$", $\frac{5}{8}$",-$\frac{11}{16}$", $\frac{3}{4}$", $\frac{7}{8}$", 32s. 6d. set. H.S. hand par reamers 11/32", $\frac{3}{8}$", $\frac{7}{16}$", $\frac{9}{16}$", $\frac{5}{8}$", 15s. set. H.S.M.T.S. reamers $\frac{1}{8}$", 7/32", $\frac{1}{4}$", 9/32", 12s. Ditto $\frac{5}{16}$", $\frac{3}{8}$", $\frac{7}{16}$", 15/32", 15s. Ditto 17/32", 19/32", $\frac{5}{8}$", 21/32", 17s. 6d. Ditto $\frac{3}{4}$", 25/32", $\frac{13}{16}$", $\frac{7}{8}$", 25s. H.S. M.T.S. spiral endmills $\frac{9}{16}$", $\frac{5}{8}$", $\frac{11}{16}$", 12s. H.S. S. & F. milling cutters, 4" × $\frac{1}{2}$" × 1", ditto $\frac{5}{8}$" and $\frac{3}{4}$", 25s. each. All first class makes. Postage extra please.—Attfield, 221, Green Lane, New Eltham, London, S.E.9.

**Surplus Lot.** Wimet tungsten carried tooltips for tipping $\frac{1}{2}$" dia. lathe tools. Set of eight tips, 10s., sample tip, 1s. 6d.—Box No. 8559, Model Engineer Offices.

**$4\frac{1}{2}$" × 22" All Geared Head** Keighley lathe, 6 speeds 30 to 600, separate feed shaft to saddle. Full set of 18 change wheels for English and metric threads, all slides are hand scraped, 9" faceplate, C, plate, fixed steady, motorised on cast iron cabinet and leg stand, this lathe is precision and sturdily built, and is new and unused, £185. Or would take Atlas or Southbend lathe in part exchange. Also for sale, one $2\frac{1}{2}$" Baty dial gauge, 65s., one $4\frac{7}{16}$" Baty, £6. One magnetic base dial gauge in case, £5 10s. All the above are new and unused. Send s.a.e. for other items and particulars to—Nash, 8, Spital Lane, Burngreave, Sheffield 3.

**For Sale. $3\frac{1}{2}$" Drummond Lathe,** motorised, screwcutting, chucks, tools.—60, Chestnut Avenue, Hornchurch. Telephone Hornchurch 8155.

**Ward Capstan,** motorised milling machine, power press, B. & S. auto, nibbler, lathe.—M. Valmar, 21, Rousden Street, Camden Road, London, N.W.1.

**£65 Myford Super 7,** motorised, 3-jaw, drill chucks, various tools, very little used. —2, Isabella Road, Homerton, London, E.9.

**IME Watchmakers' Lathe.** COM/10 (Exors Sale). 20 collets, compound slide rest. Cutting tools, motor and foot control and other accessories. Also a 6 mm. Lorch lathe complete with collets, etc.—Dowling & Co., Kings Road, St. Leonards-on-Sea. (Hastings 5222/3).

**Lathe Bed.** 2' front slide type, precision machined all over. Block phosphor bronze, 7 lb. Also odd blocks steel.—Pike, 36, Brenthouse Road, Hackney.

**Home Engineer's Workshop Contents** of little used tools, Aerograph compressor with tank air filter, spray gun, pneumatic rivetter, right angle drill, straight brace, electric right angle brace, 24" sheet metal rools, pop gun and rivets, a private sale. The lot £45 or very near offer. Apply—33, Wykeham Road, Hastings.

**Jigsaw Table** 8" × 6", throat $8\frac{1}{2}$" Uses Eclipse Junior or coping saws, 3-speed countershaft, £5 10s., photo.—Box No. 8563 Model Engineer Offices.

**Bargain E.W. Lathe,** motor, chucks, seen working, £15.—Letten, 110, Eaton Valley Road, Luton, Beds.

**Ward Capstan Lathe,** $2\frac{1}{2}$" capacity, fitted 2", ball chuck, belt drive with countershaft, £50. Norton plain grinder 3" × 18", b/c, motorised, 400/3/50, overhauled, £50. —J. H. Lines, 46, Stone Road, Stafford.

**Myford ML4,** chip tray, countershaft, 1/3 h.p., s.p. motor, chucks, accessories, lever tailstock, bargain, £30.—Poncia, 12a, Treport Street, Wandsworth, London, S.W.18.

## MODELS AND FITTINGS

**Retiring! Model Engineer** has for sale two $7\frac{1}{4}$" gauge locos. One Burrell 4 h.p. steam tractor. Reasonable offers.—W. D. Hollings, Birkenshaw, Yorks. Telephone: Dudley Hill 299.

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# CLUB NEWS

## EDITED BY THE CLUBMAN

**HERE and there in England, as the summer draws on, the sound of the traction engine is heard, bringing with it for many of us the echoes of distant summers in childhood. There is, alas, a difference: the traction no longer rocks in the mowhay as on bygone threshing days. It is instead a week-end puffer, performing for the public and delighting a generation that knew it not of old.**

Nowadays flags fly for the engine that our countryside no longer needs, and the farmer leaves his tractor on a free afternoon to see the "old tractions" which his later machines have replaced.

The latest bit of England to stand up for these handsome engines of the past is the fine and fruitful area which has its centre in Tonbridge. Owners of traction engines and steamrollers in that part of the country have banded themselves into a society to be known as **The Weald of Kent Traction Engine Club.**

Moving with a speed that was seldom known in the traction engine's heyday, these enthusiasts are already organising their first rally. It will be held at the Old Recreation Ground, Paddock Wood, near Tonbridge, on August 17.

"Preparations for this rally," writes secretary R. A. Whitehead from 42 Hadlow Road, Tonbridge, "are already well in hand, and should any of your readers be interested in entering engines for the events, entry forms may be obtained from me. . . ."

Tonbridge expects a worth-while turn-out, with many engines which so far have not been exhibited at public rallies.

### ALL SET FOR GATESHEAD

In the North of England the enterprising Tyneside Group of the **IRCMS** anticipates a large number of entries for its annual contest of radio-controlled model boats. The event opens at 11 a.m. on July 7 in Saltwell Park, Gateshead-on-Tyne, and competitors will be arriving from as far as Manchester, Hull and Edinburgh. They will steer an intricate course through a series of buoys, and then dock as in full-size practice, with a display of any special manoeuvres to follow.

The rules are those laid down for the international contests at Birmingham at the August Bank Holiday weekend, and the course is similar. Three classes provide for model boats with any form of power and radio-control, for model yachts (on an easier course) and for a speed contest, in which the same wide variety may take part, around the outside of the buoys in each direction.

Anyone may enter whether he belongs to the IRCMS or not and the fee of two shillings covers him for any number of boats and classes.

### LINCOLN'S LOCO RALLY

**Lincoln MES** is having a locomotive rally at the Boultham Park track on July 6, from 10 a.m. to 8 p.m. All clubs and unattached modellers are welcome, says chairman C. A. Bunn (9 Macmillan Avenue Country Estate, North Hykeham, Lincoln).

It is perhaps not too early to mention that an exhibition covering the whole of East Anglia and an area embracing Luton, Bedford, Peterborough and Spalding is planned for next March in Cambridge.

### ME DIARY

**July 5** Rochdale SME "Feathering of Paddle Boats," H. Partington.

**July 6** Railway Enthusiasts' Club special train over Farringdon and Malmesbury branches; visit to Swindon.
Hastings and District MES at Carnival Week Exhibition (July 6-13).
Lincoln MES locomotive rally, Boultham Park track, 10 a.m.-8 p.m.
Birmingham SME rack and models exhibition, Birmingham Conservative fete, Highbury Park, King's Heath.

**July 7** Railway Enthusiasts' Club, "The Basingstoke Canal," company general manager.
IRCMS Tyneside Group annual contest for boats, Saltwell Park, Gateshead-on-Tyne, 11 a.m.
Huddersfield SME Open Day.
Thames Shiplovers and Ship Model Society annual rally of sailing ship models, Round Pond, Kensington Gardens, London, 10 a.m.
Wicksteed MPBA regatta (prov.).
Malden and District SME loco track day; visit of Southampton Club.

**July 13** Chester-le-Street Rally. Hastings carnival exhibition ends.

**July 14** Sussex MLS visit by Romford Society.
Bromley MPBA regatta.
Birmingham SME members' social day, Campbell Green.

**July 19** Rochdale SME, Lea Hall.

**July 20** Railway Enthusiasts' Club proposed visit to Bagnalls of Stafford.
Birmingham SME track at Highcroft Hall, Erdington.

### ENTRY FORM

*(To be pasted on the back of each entry)*

Name ..................................................
(Block letters)

Address ..................................................

..................................................

If member of a club, give its name:...............

..................................................

I agree to the conditions and certify that I took the picture submitted.

Signed..................................................

**DETAILS OF PHOTOGRAPH**

Title ..................................................

Builder of model(s) in picture:

Name ..................................................

Address ..................................................

..................................................

Further details of model(s)..........................

..................................................

..................................................

Camera.................. Exposure..................

Film or plate............ Lighting.....................

Stop..................

Any other information...............................

..................................................

*PHOTOGRAPHIC COMPETITION*

## CONDITIONS OF ENTRY

1. The photographs submitted shall be of any form of model engineering and must be taken by the competitor but may be developed commercially. Prints should be unmounted, not more than 10 in. x 8 in. and not less than half-plate (4½ in. x 6½ in.).
2. Competitors may send more than one photograph but each must have a coupon from Model Engineer firmly pasted on the back. Coupons will be published each week until the closing date.
3. The closing date will be July 31. Entries to be sent to: Photographic Competition, Model Engineer, 19-20 Noel Street, London, W1.
4. A first prize of £10 will be provided, with second prize of £5 and third of £3. In addition, 10s. 6d. will be paid for each other photograph published in Model Engineer.
5. Prints will not be returned and the Editor reserves the right to publish any of them in Model Engineer.
6. Copyright of photographs sent must rest with the competitor.
7. The decision of the Editor shall be final in any question affecting the competition.

**"Maisie" Wanted,** must be to "words and music" and in really good working order.—Box No. 8560, MODEL ENGINEER Offices.

**3½" Gauge** Princess Marina, excellent performer, £120.—MAY, 23, Preston Drive, Bexleyheath, Kent.

**Wanted,** in perfect working order L.B.S.C. 3½" gauge Britannia. Particulars and price.—ASKER, 33, Salisbury Avenue, Colchester, Essex.

**Model Yacht, 3',** Braine steering gear, £5. Also 10-rater, Braine steering, two suits sails, £7.—Sea Winds, Westminster Road, Milford-on-Sea.

**Stuart Oscillating** twin steam boat engine, reversing, ⅝" × ⅝", £3 10s.—JOHNSON, 21, Strutt Street, Belper, Derby.

**3½" Gauge "Tich,"** large boiler, new, lovely job. Offers.—48, Townsend Road, Ashford, Middx. Ashford 2781.

**Sale. 1¼" × 1¼"** horizontal piston valve steam engine, first class job.—BENNETT, "Hillsboro," Staddiscombe, near Plymouth.

**3½" Gauge Locomotive Boiler,** all brazed, taper barrel, 90lb./sq. in., 4 piston valve cylinders, finished and part finished coupling and connecting rods, valve gear, several castings and 0-6-0 chassis, £10. S.A.E. for details please.—GRAY, 73, Sangley Road, Catford, S.E.6.

**For Sale. 5" Gauge,** 270' portable scale track, 4-4-0 locomotive, coal-fired with tender, four flat trucks. Details—FREWER, 2, Elm Avenue, Christchurch.

**We Have a Large Stud** of the highest quality engineer built live steam passenger hauling locomotives. Send for list—free on receipt of 2½d. stamp. We effect overhauls and repairs of the highest standards to live steam items. We are interested in the purchase of all types of locomotives, traction engines, showman's engines, stationary engines, etc.—CHERRY'S (SURREY) LTD., 62, Sheen Road, Richmond, Surrey. Tel.: RIChmond 2454.

## ELECTRICAL

**A.C. Motors Self Start,** induction 200/250 volts, 50 cycles, 1-phase, 1,425 r.p.m., ¼ h.p., £4 2s. 6d., 1/3 h.p., £4 19s. 6d., ½ h.p., £6 15s. Perfect and guaranteed. Carriage extra.—JOHNSON ENGINEERING COMPANY, 319, Kennington Road, S.E.11. Reliance 1412/3.

**Nife Alkaline** 6-volt, 200 amp hr., 5 cell in crate, £7 10s.—MELL, Longithington, near Rugby.

**2-h.p. Motor,** self start R.I. type, 110/220 volt, 1-phase, 1,450 r.p.m. Perfect condition, £15. 1/3 h.p. 230/1/50 Parkinson motor, 1,425 r.p.m., fitted clutch and 3-step pulley. As new, £7 10s. Fully recon., ½ h.p. 230/250/1/50 motor, 1,425 r.p.m., £5.—W. MOLDON, 366, King Street, London, W.6.

**Wanted. Stuart Turner 10** electric pump, good condition.—NAYLOR, "Hillbury," New Broughton, Wrexham.

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**Precision Engineers.** Want ideas, patents bought.—Box No. 8399, MODEL ENGINEER Offices.

**Watch and Clock Lathes,** cleaning machines, staking tools, etc. (Large illustrated catalogue and price list, 4s. 6d.). Easy payment terms available. Special offer Model 32 "Burnerd" 3-jaw reversible 2½" chucks with 8 mm. collet adaptors, £4 2s. 10d. p.p.—JOHN MORRIS (CLERKENWELL) LTD., 64, Clerkenwell Road, London, E.C.1. (Best prices paid for used watches).

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**Wanted.** Someone wishing to complete Stuart Turner twin cylinder launch engine with reversing gear. I will supply all castings and materials including finished base and crankshaft. Advise best price either £ or dollars. Write—IRA M. SCHEY, JR., P.O. Box 231, Lenoir, N.C., U.S.A.

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**Watchmaker's Lathe.** Good condition. Complete with accessories in case. Nearest offer £45. Owner deceased.—64, Haywood Road, Bromley, Kent.

**One 6 h.p.,** twin cylinder Mercury generator developing 2½ kw., a.c., price £80. Apply—4, Barton Arcade, Manchester.

**Wanted. Model Engineers,** covering 10 c.c. Seagull petrol engine (twin).—17, Larch Road, Balham.

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**M.E.s Unbound,** nine vols, 69-77, 2s. 6d. each. Five vols 108-112, 4s. 6d. each, plus carriage.—50, Marlborough Park Avenue, Sidcup, Kent.

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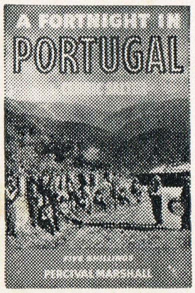


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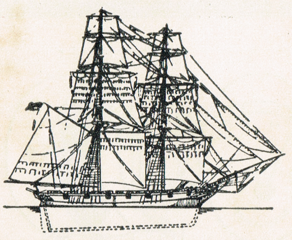

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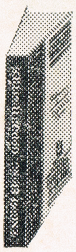

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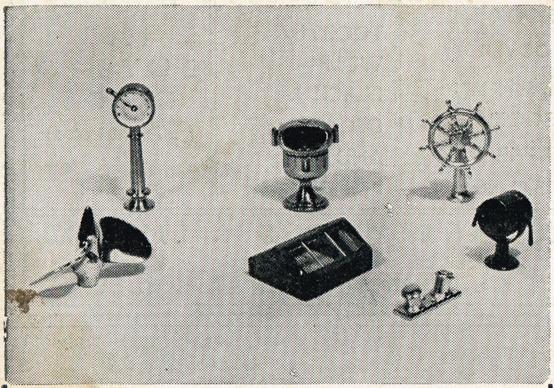

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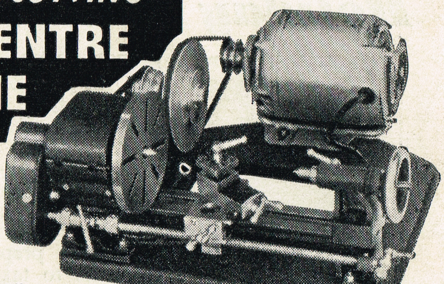

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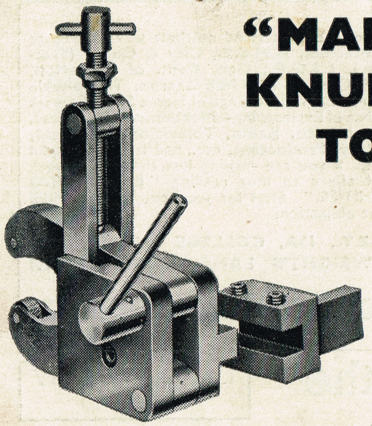

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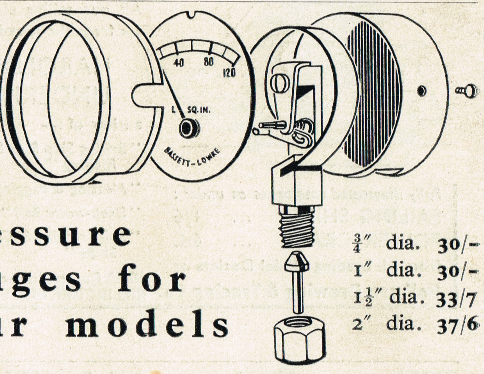


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